ARMY ORDNANCE

The Journal of the Army Ordnance Association — Now in its Nineteenth Year of Publication. Pledged to Public Service in Effecting Industrial Preparedness for War as Our Strongest Guaranty of Peace

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The Army Ordnance Association

THE Army Ordnance Association is a national organization of American citizens pledged to industrial preparedness for war as our nation's strongest guaranty of peace.

The Association endeavors to keep alive an interest in and knowledge of the design, production and maintenance of munitions. Other than a few manufacturing arsenals—six in all—there is no peace-time industry for the production of ordnance. Should war unhappily come again, industrial America will be called upon to produce munitions in great quantity and of intricate and unusual design. In an emergency, time will not permit careful study or long preparation for the production of munitions. The problem is one of vital concern.

The Army Ordnance Association believes that the solution of this problem, based on experience, lies in an active organization at all times coöperating with the Government. The principal objective of the Association is an active membership of American citizens, on whom the duty of design and production of munitions will fall in war, who will have an accurate and authentic knowledge of the complex requirements of ordnance. "Peace insurance" in this form is the foremost aim of the Army Ordnance Association.

The Association is devoted solely to the national defense; it has no commercial interests, no political alliances, and no religious affiliations. It is not operated for profit: its income is expended in furthering its aims. Its officers and directors serve without remuneration. Membership, to which American male citizens are eligible, is four dollars a year. (Application on page 386.)

ARMY ORDNANCE, the journal of the Association, is published solely for the purpose of disseminating information on the progress of our munitions developments so that American industry may at all times know its responsibilities to the common defense.

The objectives of the Association as set forth in its Constitution are:

To assist in effecting industrial preparedness for war as being one of the nation's strongest guaranties of peace;

To keep available the highly specialized knowledge necessary for arming the manhood of the nation by stimulating interest in the design and production of ordnance material;

To promote mutual understanding and to effect coöperation with American scientists, inventors, engineers and manufacturers in civil life and the Regular and Reserve officers of the Ordnance Department;

To provide, when required, the services of competent committees to investigate and report upon special ordnance subjects;

To assist in developing and maintaining an efficient personnel, both commissioned and enlisted, for the units required for Ordnance Field Service in the event of an emergency;

To commemorate the services rendered by the industry of the nation and by the officers and civilian employees of the Ordnance Department in the wars in which the United States has been engaged.

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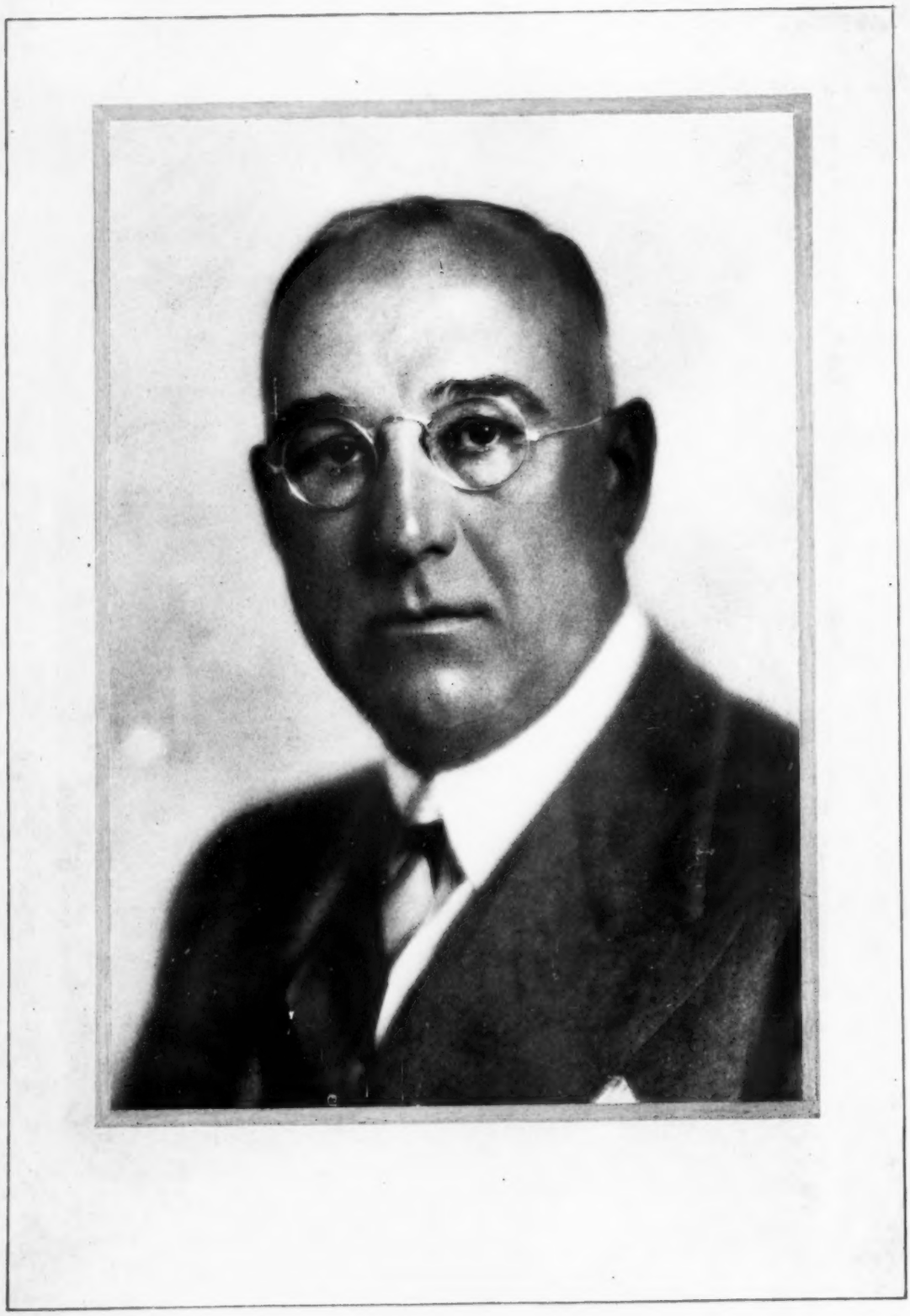

Willard R. Cox

Assistant Chief, St. Louis Ordnance District

ARMY ORDNANCE

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Fundamentals of Preparedness

Some Facts and Figures of the New Ordnance Program

By Maj. Gen. C. M. Wesson*

IT is the Ordnance Department's job in our national-defense set-up to provide practically all the offensive and defensive fighting equipment used by the Army and also some of the equipment used by the Navy and Marine Corps.

We hear a great deal today about the material side of preparedness. This phase of our national defense affects the Ordnance Department more than any other bureau of the War Department. I have been an Army officer for 30-odd years and have been in the Ordnance Department for most of that time. I have known the various Chiefs of Ordnance for the past thirty years, and there never has been one who has felt that we were devoting the proper amount of our national income to material preparedness. I am no exception.

Most informed persons are more or less familiar with conditions in Europe and Asia today. During the past year we have seen the "rule of force" adopted as the guiding principle of several of the world powers. We have seen sovereign nations absorbed by stronger nations. Germany was left by the Treaty of Versailles in a relatively impotent condition. Her army was limited to 100,000 men; her navy and practically all her army equipment were destroyed. Four years ago she started from scratch. Today she sits in the driver's seat in Europe. Last September "on the eve of Munich" a distinguished statesman said that "civilization is at the crossroads." What would he say today? What will he say a few months hence? When will the appetite of the dictator nations be appeased?

But one also may ask how does this affect the United States? Why do we have to follow European fashions? Are we not protected by our two friendly oceans? Are we not, therefore, in a safe position? But can we be assured of immunity if the rest of the civilized world becomes involved in a life-or-death struggle?

The answer of the people, who comprise this nation, to that question is given in the published results of recent polls. These established beyond peradventure that our people are whole-heartedly in support of increased armament. They feel as you and I feel, and as Congress feels, that "national safety today means national preparedness and, more especially, material preparedness."

OUR World War experience demonstrated conclusively that armies can be raised and trained a great deal faster than they can be equipped. This is even more true now than it was in 1918 because the Army's fighting equipment today is much more complicated from a manufacturing standpoint than it was then.

You well may ask, "How far should we go in arming? Where does the danger zone end and the safety zone begin?" Most things are relative in this world, and national defense is one of them. Let us try to analyze our national-defense policy. My conception of it is as follows: (1) A powerful Navy, at least the equal of that possessed by any other nation; (2) A small Regular Army to defend our foreign possessions, to man the coast defenses and supply a nucleus for training the much larger army required in the event of war; (3) A well-trained National Guard to back up the Regular Army; (4) The Organized Reserves to supply the basis for forming the war-time Army; (5) Careful plans for mobilizing and utilizing efficiently the industrial resources of the nation in the event of war.

The personnel aspect of this policy is represented by the basic war plan of the General Staff, termed the "Protective Mobilization Plan." This plan envisages a war-time field army of approximately 700,000 men supported by a replacement reserve of 300,000. It is presumed that this force will be augmented to the extent found necessary as the war develops. The Initial Protective Force is the active part of the Army covered by the Protective Mobilization Plan and consists of the Regular Army and the National Guard—a combined force of about 400,000 men. This initial protective force, as its name implies, must be ready to take the field on very short notice. It is the spearhead, the forerunner, of the larger army to be raised and trained after M-day.

THE matériel aspect of this policy is not accomplished merely by plans for the mobilization of industry. Vital as these plans are, in themselves they are not sufficient for adequate national defense. Certainly this initial protective force should at all times be equipped with the very latest and best types of equipment we can supply. Not only this, but we should have on hand at all times a *war reserve* of modern equipment in sufficient amounts to maintain and supply the field forces until new production comes into play. These facts are being recognized today by larger appropriations for new equipment and reserve stocks. This in itself is not enough. We should have a defined policy regulating our material needs in exactly the same way as the National Defense Act recognizes the personnel needs.

Much of the Army's equipment can be improvised directly from products of our civilian industries. The Army's fight-

*Chief of Ordnance, U. S. Army. This is an address delivered at an Industrial Preparedness Dinner at the Hotel Statler, Buffalo, N. Y., March 30, 1939. The sponsors of the meeting were the Army Ordnance Association, Buffalo Chamber of Commerce, and the combined engineering societies of Western New York.

ing tools cannot be so improvised. They are special and technical and are noncommercial in character. Their production requires careful planning and involves plant conversion, special tools and fixtures, and the development of a high degree of production technique. The design of ordnance is a highly specialized branch of engineering. We strive to keep our designs as simple as practicable, and above all we strive to make them adaptable to quantity production by commercial manufacturing methods. There is a limit to simplification beyond which we cannot go, because, after all, each piece of equipment has a definite mission to perform. If it cannot do its job in combat, it is just so much impedimenta for the Army. The combatant branches of the Army—the Infantry, the Cavalry, the Field Artillery, the Coast Artillery, the Air Corps—are my customers. Their needs must be met just as you must satisfy the demands of your customers.

THE following steps are necessary in developing an item of equipment for the Army. One of the combatant branches —we will say the Field Artillery—recognizes the need for a new or improved weapon. The Field Artillery in collaboration with the Ordnance Department draws up a set of what we term "military characteristics" for the weapon. These characteristics are reviewed by the War Department General Staff, and, if approved, are referred to the Ordnance Department for the preparation of a design and the manufacture of a pilot unit. The pilot unit first is tested by the Ordnance Department at its proving ground for engineering weaknesses and to make a preliminary determination to see if the unit will fulfill the prescribed military chararacteristics. Representatives of the Chief of Field Artillery are present during these engineering tests.

We will assume that the weapon successfully passes the proving-ground test. It then is given to the Field Artillery for an exhaustive field test by the Field Artillery Board. This board consists of selected officers, and its primary duty is to advise the Chief of Field Artillery on matériel and tactical matters. Again, if it passes successfully the field tests conducted by the board, a number of units are manufactured and subjected to a more extended field test by line troops. Assuming again that it successfully passes this extended service test, the Chief of Field Artillery and the Chief of Ordnance recommend to the General Staff that it be adopted as a standard item of equipment for the Army. When finally adopted as a standard, the design must be production-engineered. It is then ready for quantity production. The number produced and actually issued to the Army will depend, of course, upon the funds made available by Congress.

Research and development are responsibilities of the first magnitude. If we were in that fortunate position where the types of our equipment were the best of every kind in the world and were likely to remain so for an indefinite time, there would be little need for research leading to the development of the new and improved designs. Unfortunately, this is not the case. As technology advances, science is continually developing new types of combat equipment and effecting improvements in existing types. The Ordnance Department must be alert as regards engineering and scientific developments which, though not primarily military in character, may be used in producing more efficient fighting equipment.

Since Ordnance equipment is essentially special and has no counterpart in commerce, and since the great bulk of military supplies required in war must be produced by private industry, it is necessary that designs, so far as possible, be susceptible of quantity production by commercial manufacturing methods. Every effort, therefore, is made to incorporate in these designs articles of commercial manufacture wherever it is possible to do so.

Before leaving the subject of development, permit me to emphasize the policy of the Department with respect to new ordnance inventions. This policy is simple and direct. I believe you will agree with me that it is logical and fair. It may be stated in a few words: The Ordnance Department strives to maintain an alert and open mind in the whole field of ordnance development. Whenever there is brought forward a new or improved piece of equipment which offers advantages over the approved standard type, there must be made without delay a careful and comprehensive appraisement of the situation. The responsible agencies of the War Department, together with representatives of the Congress, to whom we must look for footing the bills, must gather around the table, so to speak, and weigh all pertinent facts. They not only must determine whether we are justified in scrapping the item to be replaced, the spare parts and stores for maintaining it and the special aids to manufacture for producing it, but they also must take into account the cost and time to produce the new item in the light of the situation then prevailing. All these factors must be .reckoned with in reaching a sound conclusion. Our policy is believed to be not unlike that of the sensible business man who is ready to make changes when they foreshadow increased dividends by increased efficiency.

LET us now consider the current armament program in some detail. The Seventy-sixth Congress is now processing three bills which affect national defense and which apparently will be passed without material alterations: (1) The regular 1940 appropriation bill carrying approximately $500,000,000 for the War Department. Of this amount, approximately $49,000,000 will be expended by the Ordnance Department. (2) The Aviation Expansion Bill totaling $300,000,000 also concerns the Ordnance Department, because airplanes must be equipped with guns, and there must be available the necessary bombs to enable the airplanes to carry out their mission. Roughly $12,000,000 will come to the Ordnance Department from this source. Included in this bill is a provision for educational orders on a greatly enlarged scale. A total of $34,500,000 is appropriated for this purpose.Of this amount, approximately $26,000,000 will be for the Ordnance Department. (3) The so-called Second Deficiency Bill carries a total sum of $116,000,000 of which over $100,000,000 is for ordnance.

Thus there will be available to the Ordnance Department for expenditure over the next two years close to $180,000,000. You may ask why the Army needs all this money for Ordnance equipment and ammunition. The story is as follows: 1. A period of lethargy followed the World War. Large World War stocks were on hand. Our former adversaries were disarmed. The League of Nations was created with the hope that through it international disputes could be amicably settled. 2. While developments in Ordnance continued there was no rearming. We were all growing obsolescent together. There was a comfortable feeling of security. 3. The picture was radically changed when a few years ago certain so-called aggressor nations started intensive

rearmament with the latest and most improved types of munitions. This has been followed by other nations until today we find ourselves short of new types developed in the past decade, existing types which can be modernized by modification, existing types which need complete overhaul for serviceability, ammunition for new guns and replacement for deteriorated ammunition. What will this sum do for the Army? With the exception of a few items, it will equip the Regular Army and the National Guard, our Initial Protective Force, with modern matériel and with ammunition reserves. With this equipment and ammunition available, the Initial Protective Force can take the field with the assurance that they are equipped with the best types of matériel and ammunition available at this time.

CONSIDER now how this relatively large appropriation will be handled by the Ordnance Department. The Department has two sources of supply—the manufacturing arsenals and private industry. The arsenals are important elements in our scheme of national defense. In time of peace they assist in the development of new designs and the improvement of existing matériel. Under normal conditions we depend upon them for manufacture in sufficient amount to uncover production difficulties and to standardize methods of manufacture. They provide training centers for personnel in both peace and war and will supply a nucleus of trained leaders to assist in the inauguration of quantity production. We depend upon the arsenals for the development of that manufacturing technique so essential for the successful quantity production of complicated items of equipment.

It is mainly through the arsenals that the art of manufacture of ordnance is kept alive. They provide centers for the training of personnel in both peace and war, and provide a nucleus of trained personnel to assist in the inauguration of mass production. They should serve as a model for the particular items which they manufacture.

It is not contemplated that the arsenals will be expanded in any way. Full use, however, will be made of their existing facilities, and it is to the arsenals that industry must look for manufacturing experience on the items it will be asked to produce under this program. To accomplish their mission successfully, the arsenals should at all times be kept modern as to machine tools and equipment. A recent survey showed that 80 per cent of the machine tools installed in the 6 arsenals average 18 or more years old. We, therefore, have an arsenal rehabilitation program of $16,000,000 to modernize the arsenals. We are encouraged by the action of the Senate committee in providing $6,000,000 for this purpose last week. If and when the modernization project is completed, we estimate that the six arsenals can produce only about ten per cent of the ordnance required in a major war.

The purchasing organizations of the Ordnance Department, which will deal directly with industry, are located at the manufacturing arsenals. Each arsenal has a definite responsibility and will handle the contractual procedure for their particular items. This will involve the preparation of specifications, proposals, contracts, the sending out of proposals, drawings, and finally the execution of the contracts. The bulk of inspection will be handled by the procurement districts, and we have for the past six months been making considerable preparation in building up the organization to handle this work.

The operations of the Ordnance Department are necessarily controlled from my office in Washington. I am fortunate in having as my two principal assistants, General McFarland and General Harris. General McFarland heads up the military side of the Department's activities and also serves as chief of the Department's Technical Staff. General Harris is in charge of the industrial activities of the Department. The manufacturing arsenals come under his control as also do the procurement districts. He will be in direct charge of procuring the matériel provided for in the armament program. The storage, issue, and maintenance of this matériel will be the responsibility of General McFarland.

The Department has today 320 officers and 14,219 employees to carry out its responsibilities.

NOW let us consider the armament program from the viewpoint of American industry. We estimate that seventy-five per cent of the funds available for procurement will be placed with private industry. This should have a beneficial effect on industrial activities. The following items are to be procured: 8-inch railway artillery carriages, light and medium tanks, scout cars, 105-mm. howitzers, 155-mm. guns and carriages. The following ammunition also is to be procured: 37-mm. antitank, 37-mm. antiaircraft, 81-mm. mortar, 75-mm. howitzer, 155-mm. howitzer. We have been able this past year to place some sizable contracts with private industry. As an illustration of how the work involved in one contract is spread to industry at large, we placed a contract this fiscal year for $1,500,000 worth of antiaircraft gun carriages. In carrying out this contract, I find that the prime contractor has himself placed subcontracts with sixty-seven different concerns. Some of these concerns are located hundreds of miles away from the prime contractor's plant. It will thus be seen that even if the number of prime contracts placed is not large, the subcontracts for components and for materials will cause a widespread distribution of the funds appropriated for armament.

As previously stated, inspection will be handled by the procurement districts. These districts are located in most of our great industrial centers. There will be no delay in inspection, and I trust that the inspectors will invariably display sound common sense in their dealings with private industry.

NOW a few words on industrial preparedness. This subject has received attention for many years, and recently this attention has been intensified. Under the National Defense Act, the responsibility for heading this all-important war-planning activity is placed upon the Assistant Secretary of War. The present occupant of that position, the Hon. Louis Johnson, has done more than any one man to acquaint the country at large with the problems involved in material preparedness—and after all, that is what industrial preparedness means.

It has been aptly said that modern war is a war of machines. It is a war of whole peoples, and in order to win, the entire national effort must be put forth. It is now recognized that the industrial effort is fully as important as the military effort. The objective of our industrial-preparedness plans is to insure that the industrial effort will be exerted promptly and efficiently.

We thus can define industrial preparedness as "a state of readiness on the part of industry and Government to promptly supply the mechanical aids and equipment neces-

sary for the military effort." Carefully considered plans must be available for the use of a war-time administration for organizing and leading the economic resources of the entire nation toward the successful prosecution of any war in which we may become engaged.

To insure a degree of industrial preparedness we have been carrying on for the past fifteen years negotiations with private industry for the production of munitions in the event of war. We call this phase of industrial preparedness, "procurement planning." You will be interested in the organization devised for carrying out the War Department's procurement-planning activities. Each supply branch maintains a number of procurement districts commensurate with its particular problem. The Ordnance Department, having perhaps the greatest war problem, has established fourteen procurement districts. The work done by these districts has been of transcendent importance in national defense. Industry has given us whole-hearted coöperation in this work.

There are 575 items of ordnance, noncommercial in character, which have been assigned the districts for planned procurement. Accepted schedules of production have been placed through the procurement district offices for all these items. The real value of these accepted schedules of production only can be determined by actually putting them into effect. This we shall never be able to do unless we are unfortunate enough to be engaged in another war. These production schedules are of great importance.

CONSIDER now how the funds appropriated for armament will affect industrial preparedness. We have said that the production of noncommercial items of ordnance requires careful planning and involves plant conversion, special tools and fixtures, and the development of the essential production technique. In other words, plants unaccustomed to the manufacture of ordnance must in some manner be educated as to the special problems involved. This very essential education can be obtained in two ways: (1) By the placement of *peace-time orders with private industry* and (2) by means of educational orders.

A major part of the $180,000,000 to be expended by the Ordnance Department during the next two years will be placed with private industry. This will in itself supply a good many plants with a very fine type of education in the actual manufacture of ordnance on a quantity-production basis.

The Ordnance Department will have available for the second method—educational orders—during the next two years, approximately $26,000,000. Educational orders should accomplish in some part the following: (1) A test of our specifications and drawings; (2) Proof of our production designs; (3) A production study showing for the particular item the methods to be used in its production; (4) Creation of gages, dies, jigs, tools and fixtures for the particular item; (5) Manufacture of a sufficient quantity of the item to test the methods developed by the company.

It is estimated that educational orders will go to some 250 industrial plants. The companies operating these plants will be the prime contractors, but orders for tools, parts, and materials necessarily will spread this education among a great many additional plants.

What, then, about the effect of industrial-preparedness activities on Western New York? Our records show that the total value of the ordnance war load placed in the procurement district of which Western New York is a part, approximates $268,000,000. Sixty separate companies have been allocated to the Ordnance Department for handling this tremendous load. Subcontracts for components and materials undoubtedly will spread this work to many hundreds of plants. Included among the items to be produced in New York in the event of war will be fuzes, fire-control instruments, ammunition components, and machine guns.

I NOW wish to mention what I regard as one of the most important elements of Ordnance preparedness; I refer to *personnel*. Plans for Ordnance preparedness, however complete they may be, are worth little more than the paper upon which they are written unless they are carried out by capable and energetic personnel. I believe the Department is particularly fortunate in this respect. Consider, if you please, some of the essential elements of Ordnance procurement personnel. I believe them to be the district chief, the assistant district chief, and their Reserve officers; the executives and directing heads of our great manufacturing concerns; public-spirited citizens whom we find in great centers of industry; and finally, the membership of the Army Ordnance Association. All four groups are represented here this evening.

Shortly after the World War, a distinguished group of public-spirited citizens—men who had held positions of great responsibility during the war—got together and organized an association which they called "The Army Ordnance Association." For twenty years this Association has fought tenaciously and continuously for adequate industrial preparedness. It always has supported the Ordnance Department in its efforts toward this end. The ideals of the Association are today being in some degree realized. Our country is, in my judgment, greatly indebted to the Army Ordnance Association.

I wish also publicly to thank Colonel Cogswell, chief of this Ordnance Procurement District, and Mr. Bausch, assistant chief, for their unselfish and untiring efforts in behalf of the Ordnance Department. These gentlemen and their splendid corps of Reserve officers are administering the district in a highly satisfactory manner.

Now, gentlemen, we are a great nation; yet all of the wars in which we have been engaged have found us unprepared. Unpreparedness has cost us much blood and untold sums of money. Reasonable national defense is the best insurance against war. An America prepared to defend herself and her interests, both at home and abroad, is a stabilizing influence in world affairs.

As for the Army of the United States, it ranks eighteenth in size among the armies of the world. Its very smallness is the most convincing evidence that to be effective it and the National Guard should be equipped always with the best types of implements of war. This equipment cannot be quickly produced. It is noncommercial and highly technical. Therefore, plans for war-time production, while vital, are not sufficient. There must also be provided adequate reserves of material sufficient to meet the essential needs of our troops until such time as they may be produced by industry.

The Ordnance Department is essentially an engineering and manufacturing organization. Industry and our great engineering societies have always coöperated with us to an outstanding degree. Without their coöperation we never can wage a successful war. We cannot even plan successfully for war. I therefore salute American industry!

Proving Ground in Spain

Armament Trends as Revealed by the Civil War

By Brig. Gen. Henry J. Reilly*

THE Germans have profited by the Spanish civil war to find out in what ways they erred in the theories evolved from the lessons of the last war and from subsequent peace-time experiments. They are making changes accordingly. Having been practically disarmed on land and entirely so in the air as the result of the terms of the Versailles Treaty, Germany had the advantage of being able to start rearmament from the ground up.

This was true not only for the arms and equipment for the land and air forces, but also for her industry. The only trouble was that until the civil war in Spain furnished the opportunity to test some of the new material and armament, the Germans could not be sure the changes they had made were right. In other words, the test of war, when it came, might show that the theories based on the Great War, evolved during twenty or more years of peace, were erroneous. The danger was, of course, that once committed to war on a large scale it would be difficult, if not too late, to make good the deficiencies exposed by battle.

The United States has been partially disarmed, first because our national-defense policy embodied in the National Defense Act calls for limited peace-time land forces, and secondly, because we have not even brought our land forces and their reserves of material and weapons up to the point prescribed by this act. While we have done a great deal on paper toward industrial mobilization, we have not yet taken the proper steps to prepare the jigs, dies, and tools necessary before manufacture could begin. This gives us the same advantage as that possessed by Germany when she started her rearmament.

We can have an additional advantage if we care to accept the lessons of the Spanish civil war and use them as the basis of the rearmament of our land and air forces and the organization of our industry to insure prompt and efficient mobilization if war comes.

Since the Battle of Teruel, December 1937—January 1938, the war in Spain has been on a sufficiently large scale with respect to numbers engaged, training of troops, and leadership of officers, to be worth serious study. The weapons used have been sufficiently modern and numerous both on land and in the air to make the lessons learned worthy of acceptance.

Considerable changes are being brought about by the direct use in battle of heavy bombers and assault aviation. The conception of the armed and armored motor vehicle as being valuable primarily because of its speed has changed to one of a weapon which is valuable primarily because of its fire power and resistance to fire under certain circumstances. In other words, the armed and armored motor vehicle is tending to become, like field artillery, useful primarily in furnishing accompanying fire for infantry and cavalry attacks. The speed of such vehicles and the speed of aviation, particularly assault aviation, have greatly emphasized the necessity for fire protection of the infantry by accompanying artillery working either in the hands of the infantry or in the closest physical support.

The height and speed of the heavy bombers necessitate anti-aircraft guns light enough to be taken into the field but heavier than the usual 3-inch field gun. The necessity for a large number of these guns makes it desirable that they should be all-purpose; that is, they should be usable not only against aircraft but also against targets on the ground.

The failure of mechanized and motorized units to operate successfully over much of the terrain, shows that the question of types of motor vehicles, particularly with reference to their ability to stand up under hard work, needs to be thoroughly investigated.

THE reader may well ask, "How are these conclusions reached?" The answer is by what the Army calls "personal reconnaissance." I came into Spain from Portugal having spent two months en route flying around the western Mediterranean via Italy, Sicily, Tunis, Algiers, Morocco, and Tangiers so as to get an idea of the general situation before getting down to the special situation of just how the civil war was being fought.

I then spent more than four months—with the exception of a week at Burgos and a few days in San Sebastian—with the Army of the North, either at its headquarters in Saragossa or visiting the front along the Segre and Ebro Rivers, the Mediterranean near Vinaroz, Castellón de la Plana, the Mijares River, the mountainous section from Morella to Teruel, Sarrion, and El Toro—the last two being on the advance from Teruel to the Valencia plain.

I met and talked to Spaniards, Italians, and Germans of all ranks and all services, including aviation. I talked to the wounded, to captured officers and enlisted men representing, incidentally, eleven nationalities. During twenty visits to the actual front, I saw nine attacks—the smallest being that of a single division of infantry, the largest that of two army corps totaling nine divisions. The basis of the Spanish Nationalist division is 12,000 infantry with artillery and services—the total strength being around 16,000.

Before long, it was evident to me that Franco's army was built on the same foundation which General Pershing laid down for the A.E.F.—that of the disciplined, educated, efficient soldier. Generalissimo Franco is a soldier of high professional attainment and considerable experience. Any officer under his command who fails to attain and keep a high professional standard, goes to the rear. The route to a commission is only through service in the ranks at the front and then a period of formal training at a school—graduation from which yields a commission only as a *provisional* second lieutenant. Sergeants of artillery and engineers must arrive by a similar route. Aviators are thoroughly schooled. The pursuit pilots only arrive after several periods of schooling alternating with service at the front.

Now let us see what conclusions some of the officers at the

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front reached as a result of their battle experience. Let us start with General Aranda, at the time of my visit an army corps commander, and at this writing commanding general of the Army of the Levant. I visited him one cold winter day on a barren hillside from which he was watching the attack of one of his divisions on the high hills in which the Government forces had entrenched themselves to prevent the Nationalists from getting possession of the Cati Valley running south from the Alcaniz-Vinaroz highway. To reach him we had passed four batteries of German 88-mm. guns. Before we came in sight of them we had seen their shells bursting around some Government airplanes apparently engaged in a reconnaissance. As we came up to them and during the whole of our visit with Aranda in his observation post, they were firing on enemy trenches. The period between their fire on the airplanes and their change to fire on the trenches was one of only a few minutes. How much of this time was used in adjusting the carriage so that the thrust from the fire at less than high-angle would be taken up, I do not know. I was not allowed near enough the battery to find out. When I asked, the question remained unanswered.

Russian Tank Captured by Nationalist Forces Near Benicarlo, Spain, April 1938

This was the first but not the last time in which I saw the fire of German 88-mm. batteries switch with very short delay from aircraft targets in the air to trenches on the ground, or vice versa.

After pointing out the operations on the ground and showing us on the map where his other four divisions were operating—as he had a total of five in his army corps—General Aranda showed himself quite willing to talk. Prior to the civil war, he had served a total of eighteen years in Morocco. Besides this practical experience, he is a graduate of the Spanish Infantry School and also of their Staff College. He is a strong believer in putting in the hands of the infantry control of the weapons needed to permit them to destroy the enemy's resistance to their immediate front and protect themselves from the close attack of airplanes and tanks. When on a narrow front, he would put these weapons under the control of the colonel. On a fairly wide front, with several battalions in line, he would distribute them to the battalions. On the defensive he would give them to the companies. In any case he wants the companies to have light mortars.

He insisted the 37-mm. antitank gun was not powerful enough to combat the enemy tanks, most of which are armed with 45-mm. cannon. He said that of the weapons available for antitank defense, the 65-mm. mountain gun transported by pack mules was the best because it can be transported in the most difficult country, does not constitute a large target, and has better ballistic qualities than the 45-mm. tank gun. He expressed admiration for the German 88-mm. batteries, praising the ballistic qualities of the gun and the efficiency of the officers and men manning them. He pointed with great pride to the accurate fire of these guns then being delivered against the enemy's position across the valley from where we stood.

General Batisti is an Italian serving in Spain. He graduated from the Italian Military Academy in time to fight as a second lieutenant of infantry in Tripoli in the war with Turkey. He fought throughout the Great War in the Alps as an officer of Alpini, finishing as a lieutenant colonel. He fought throughout the Abyssinian campaign, coming home a colonel. He reached Italy by plane from Abyssinia just as the first Italian Expeditonary Force was leaving home. He promptly asked to go to Spain and was given a commission as the chief of infantry or brigadier general of the Twenty-third of March Division which had just been formed of Italian volunteers. In the Catalonian campaign he commanded the mixed Spanish-Italian light division called "The Green Arrow."

I found him always eager to discuss every phase of organization, command, armament, march, and battle. On one occasion, with his aide-de-camp and the maps which he actually used, he took me over the battlefields and marches of the Italian Army Corps from the end of the Battle of Alfambra in February 1938 to the arrival on the banks of the Ebro at the same time Aranda's troops reached Vinaroz on the shores of the Mediterranean.

General Batisti advocates placing the light trench mortar in the hands of the infantry. However, he thought the 45-mm. Italian mortar and the 50-mm. Spanish one did not fire a heavy enough shell. Therefore he was inclined to favor a 75- or 80-mm. mortar. He is a strong believer in the 65-mm. mountain gun as the best infantry close-support and antitank weapon. This not as much because of the range as because of the power of the shell. He believed each regiment of infantry should have a mountain battery continuously under its direct control.

Like every one else who has seen combat, he strongly believes in the power of fire. He wants the divisional artillery to be as mobile as possible but above all he wants it to have plenty of fire power. Like Aranda and all the other Spaniards, he is a great admirer of the German 88-mm. gun.

GARCIA VALINO served under Franco in Morocco as a young officer in the campaign against Ab-del-Krim. Full of energy and determination and, like Stonewall Jackson, always driving his men in long hard marches forward and yet winning their admiration, he has risen rapidly during the progress of the civil war because his hard and swift blows always succeeded.

When I first met him he was in command of a division. In the Catalonian campaign he commanded an army corps. We met at a place called Mosquerela, in the rugged mountains between Morelia and Teruel, where he was preparing the blow—struck a few days later with his Spanish division

and a mixed brigade of Italians and Spaniards—which carried him through a difficult mountain country that the Government troops did not believe he could penetrate, down to the Mediterranean plain near Castellón de la Plana. He came so rapidly that most of the Government forces to the immediate front of Aranda, fighting down the coast, were cut off with resultant large captures of men and material.

Like all the Spanish generals at the front, once they find you have a military education and experience and are really interested in the technical side of the war, he talked quite freely; his conclusions were the same as those of Generals Aranda and Batisti.

One day, on the Mediterrean, south of Vinaroz, I met and talked to Col. Mohamet Mezeian, a tall, handsome Moor, who not only has an excellent combat record but also graduated near the top of his class in the Spanish Staff College. He had arrived at the same conclusions as Aranda, Batisti and Garcia Valino. Many other officers talked to, some infantry, some artillery, some general officers, had reached practically the same conclusions.

MOUNTAIN GUN AND ANTITANK GUN CAPTURED FROM RED FORCES, CASTELLÓN DE LA PLANA, SPAIN, 1938

IN talking to officers about tanks shortly after my arrival at Saragossa, I was told of the Battle of Firente de Ebro in which ninety to one hundred Government tanks attacking *en masse* undertook to break through seven companies of Nationalist infantry, capture Saragossa and open the valley to the Ebro as a means of cutting Franco's army in two. The seven companies by means of bottles filled with gasoline and sulphur, and hand grenades, to say nothing of considerable "intestinal fortitude," defeated the attempt. They burnt or captured something like thirty tanks. (See *L'Illustration*, Paris, France, No. 5004, January 28, 1939, for an account of this battle by the author.) I visited the battlefield a number of times. Evidences of the savagery of the combat were everywhere, including partially burned Russian corpses. I talked with some of the participants.

The light tank already had been condemned by both sides prior to this battle. It had been found guilty of not being strong enough to stand up under hard usage in war, of giving its crew no protection from enemy attack and of being unable to damage the enemy seriously. The Battle of Firente de Ebro convinced both sides that independent tank forces are a delusion and that the rôle of the tank is the more modest but highly important one of helping the infantry forward.

In the first attack of a Nationalist infantry division that I witnessed, aviation took as definite a part as artillery and tanks. First, as in 1914-1918, came the artillery preparation—a heavy shelling of the enemy's entrenched position. Then fifteen heavy bombers flew above and along the trench three times, each time bombing it from end to end. Then twelve medium-sized biplanes dove one after another along its length dropping light bombs, repeating this maneuver several times. They then flew along the length of the trench repeatedly, alternate machines bombing and machine gunning. Finally, they flew along the trench several times, each airplane using its machine guns. I know, from what I saw and heard, that this is standard practice.

In pursuit after a successful battle, horse cavalry supported by heavy bombers and airplanes with light bombs and machine guns is the usual means of exploiting victory.

Napoleon I said, "Fire is everything, the rest is nothing." During the Great War the tremendous increase in automatic weapons and artillery produced a fire in battle such as the world had never seen before. However, during that war, despite the tremendous increase in the volume of artillery fire, the infantry was not satisfied with the protection given by the artillery either in attack or defense. The reasons were simple: First, it was very difficult to get liaison which would work efficiently enough to insure that the artillery fire could be promptly switched to the targets which most bothered the infantry. Secondly, particularly in the offensive, the artillery fire was not accurate enough to dispose of small scattered targets such as machine-gun nests. Therefore, as the war progressed, the infantry insisted on having small artillery weapons in their own hands for their own use. These were trench mortars and one-pounders or similar small cannon.

In an effort to make good their deficiency, the artillery frequently tried sending field guns forward with the infantry as accompanying guns. This seldom proved successful. In the first place, the guns, particularly when changing position, presented too large a target. This not only led to horses, guns, and crews frequently being put out of action, but it also led to the infantry in many cases objecting to their presence. The individual infantry soldier is a small target; when he goes forward with hundreds or thousands of others there is nothing to distinguish him. However when a large object like a field gun with a team of six horses shows up in his neighborhood, the enemy naturally concentrates its fire on that vicinity, thus putting the infantry soldier there in far greater danger than he otherwise would be.

Thus, before the Great War was over it was quite evident that the infantry needed for its own protection on the defensive and to overcome small targets to its immediate front when on the offensive, weapons small enough not to make too much of a target and yet with an explosive projectile which could destroy without making a direct hit—something that the rifle and machine gun cannot do. At the same time it was evident that the accompanying artillery for infantry should have light howitzers so that they could take advantage of protection furnished by the terrain to get closer to their own infantry than was possible with the flat-trajectory field gun.

The Spanish civil war has accentuated these tendencies. It has definitely shown on the battlefield again and again,

from the Battle of Teruel in December 1937–January 1938 to the Catalonian campaign of this year, that the following are true:

1. The infantry must have in their own hands small weapons which make sufficiently inconspicuous targets to survive the preparatory artillery and aviation fire so as to be used for the close combat of the infantry.

2. The artillery in close support of the infantry must be able to deliver high-angle fire so that it can take advantage of the terrain to be in close physical touch with the infantry while at the same time getting sufficient protection to prevent being destroyed before the time comes for its use.

3. The artillery, to destroy the enemy's trenches, to destroy tanks at ranges in excess of the range of the infantry antitank guns, and to reach the enemy's aviation approaching at a high altitude, must have a caliber and power that necessarily make a piece too large to be brought safely within range of hostile infantry weapons.

4. Tanks must be heavily enough armed and armored to furnish a mobile supporting artillery to go along with the infantry and furnish an accompanying artillery fire.

5. The small artillery weapons in the hands of the infantry must be all-purpose; that is, they must be capable of effective fire at close ranges against tanks and aircraft.

6. The artillery of larger caliber, not in the hands of the infantry, also must be all-purpose; that is to say, capable of long-range fire against all types of targets on the ground and also against aircraft flying at high altitudes.

7. The attack with heavy and light bombs and machine guns by aviation has become as much an integral part of the infantry assault as the artillery preparatory fire and the accompaniment of tanks.

In determining what calibers are necessary in accordance with these principles, there probably will be no dispute that infantry companies and perhaps even platoons should have a small light mortar of from 50 to 60 mm.

The question of what caliber is best to give the infantry the means of close protection against tanks and low-flying airplanes is much more difficult to solve. The 37-mm. antitank gun easily can be put out of action by a tank carrying a 45-mm. gun. Also, it is quite a fair-sized target and therefore has little chance of surviving the preliminary artillery fire and the aviation bombing. Here there is room for a great deal of experimentation until an all-purpose weapon is made powerful enough to do effective damage at close range and small enough to escape destruction—thus being available to the infantry at critical moments.

As stated above, the Spanish and Italian infantry are content with the close support of the 65-mm. mountain gun. Here there is room for experimentation to see if the work done by this piece cannot be done better by one of around 100 mm. without getting too large a target to be in close physical support of the infantry and still have a reasonable chance of survival.

The question of the main artillery support for the infantry in attack or defense, not only against targets on the ground but also in the air, brings up the serious question as to whether or not the day of the 75-mm., the 77-mm., the 3-inch gun, and guns around these calibers has not passed. The 77 has disappeared from the German infantry divisions. The first all-purpose German guns tried out in Spain were 77 mm. Finding this caliber insufficient, they brought out a larger caliber—the 88-mm.—which apparently is giving satisfaction not only against airplanes but also for long-range fire at targets on the ground. While a somewhat larger target than the 77, the increase in size is more than compensated for by the greater fire power which permits its effective use at longer ranges.

JUST as the armored car has a few limited missions it can perform, so probably the light tank has a few missions for which it is better suited than a more heavily armed and armored but slower vehicle. However, as far as the real battlefield is concerned, the evidence from Spain is that the primary mission of the tank and the one mission it can successfully accomplish is that of mobile artillery which furnishes the accompanying fire for the infantry by going along with it and directly attacking the targets which hold up the infantry advance.

At no time in my 4½ months in Spain was any accompanying fire by the field artillery seen. The accompanying fire was furnished by the tanks and by the assault aviation which remained hovering above the battlefield to attack simultaneously with the tanks any of the enemy whose stubborn resistance was holding up the infantry.

Now that we are beginning our rearmament by preparing our industry, there are two paths open to us. Once we choose and spend millions of dollars on one, it will be extremely difficult, and perhaps too late, to change to the other when war comes. Therefore it is of the greatest importance that we choose the right one now.

These two paths are: (1) To provide merely for improvements in existing types of weapons and weapon carriers and (2) to develop now the types of weapons and weapon carriers which will best meet the conditions of the modern battlefield. If we are not content to accept the lessons of the civil war in Spain, then we should begin a series of experiments, not with a single type of weapon but with a combination of different types under battlefield conditions. In other words, let us experiment with the whole keyboard of the piano at the same time so as to get a harmonious tune, and not do as we have always done in the past—merely experiment with one or two keys at a time. Perhaps this method produces better single notes but it destroys the harmony because the other notes are out of tune.

The World War proved that artillery, infantry, and machine guns were not separate entities. Now, the Spanish civil war shows that the conception of independent air and mechanized forces winning victory without the older arms is wrong. These newest weapons in the arsenal of Mars must, within the limits of their powers, continue with the older arms to produce a harmonious attack or defense.

Editor's Note.—This article was written and accepted for publication while the Spanish War still was being fought. Indeed, the manuscript was received coincident with the fall of Barcelona. Hence the author's references are to a conflict still in progress. The illustrations are from enlargements of snapshots taken by the author while in Spain. For other articles which have appeared in Army Ordnance on the Spanish War, readers are referred to "Forecasts from the War in Spain" by Emilio Canevari (Vol. XVIII, No. 107, March-April 1939, p. 273); "Propaganda and War" (Vol. XVIII, No. 105, November-December 1937, p. 147) and "The Spanish War" (Vol. XIX, No. 111, November-December 1938), both by Maj. Gen. J. F. C. Fuller.

How Will We Defend America?

A Critique of Major Eliot's "The Ramparts We Watch"

By Hoffman Nickerson*

MAJ. GEORGE FIELDING ELIOT in "The Ramparts We Watch" (New York: Reynal & Hitchcock, Inc.) has deserved well of the Republic. In these confused and difficult times it is encouraging to note the instant popularity of so sound a book. From its apt title to its stirring conclusion, "The Ramparts We Watch" is admirable. It deserves to rank beside Upton's classic "Military Policy in the United States" on the narrow shelf of first-rate American military books.

The present writer is by no means at one with Major Eliot on a number of matters not essential to the main theses. Did time and space permit, it would be both interesting and profitable to discuss some of these disagreements. For instance, one rubs one's eyes with amazement at several statements of his concerning Spain. That people of little judgment or knowledge of the world should be impressed by Red propaganda is natural enough, but when we find a man of our author's caliber believing that the abominable Popular Front in Spain has anything to do with either freedom or decency, one is astonished indeed. O Red propaganda, what lies are told in thy name! One falls back on familiar texts like that which describes the Devil as going about like a roaring lion, or that other which tells of the false prophets who would deceive, if it were possible, even the very elect! So too, he gratuitously attributes many evil designs against the United States to the Germans, Italians and Japanese, all of whom have more important fish to fry nearer home.

It would appear to be an error of fact to say that Madrid was defended against Franco in 1936 by the Red Spanish militia. The consensus of informed opinion is that the heavy work was done by the international brigades whose courage and skill must be applauded even by those who despise their opinions. Fears of "a puppet Spain controlled from Rome and Berlin" make one ask whether the author has ever visited Spain or known many Spaniards. A people less likely to serve interests foreign to themselves could hardly be imagined. An enemy of theirs might more justly accuse them of pushing national pride and the love of independence unreasonably far.

All this by no means implies that the author is in the least Red. On the contrary, his condemnation of the shameless confiscations of foreign property in Mexico by the Cardenas government, together with his vigorous defense of the national duty to protect Americans and American interests abroad leaves nothing to be desired.

Again it is surprising to read that the Bahamas "abound in anchorages and harbors suitable for sea-going ships." After not a little small-yacht cruising among those islands, the present writer has failed to discover any such abundance.

Major Eliot also makes certain doubtful statements on the eternal question of the National Guard and the related question of maintaining public order. In suggesting the use of the Guard regiments largely as depot battalions for feeding war-time replacements to Regular units and in proposing to scrap Guard traditions by abolishing a number of historic units, he seems to appreciate insufficiently what the Guard is. It is a military club whose members, at considerable inconvenience to themselves, voluntarily assume heavy responsibilities to their states and to the Nation. For this sacrifice they receive very few tangible compensations, prominent among which are the club privileges, as it were, of their unit. This in turn depends in great part upon the tradition of that unit, and no men more justly appreciate the value of tradition in upholding morale than do soldiers. The idea of close association between certain Regular and Guard units is excellent, but that this association could be intimate enough to reconcile the Guard to becoming a mere source of replacements seems improbable.

BESIDES being a military club, the Guard constitutes the emergency police force of the states which own and maintain its armories. As such, it often has been called out to maintain or restore order in time of strikes. Consequently, union labor has a certain prejudice against enlistment in its ranks on the ground that "it is used to break strikes." To abolish this prejudice would indeed be a fine thing. Moreover disorder is more economically repressed by professionals enlisted for the purpose. Consequently, as the author sensibly suggests, state police forces are desirable. But to argue that governors should no longer be allowed to call out the Guard—with its equipment furnished by the Federal Government—to repress disorder, except with the permission of the President, is strange reasoning indeed. Why then should the states maintain their armories? The author seems to imagine state governors as bloodthirsty fellows burning to mobilize their Guardsmen to shoot strikers. It would be at least as reasonable to complain of the average governor for slackness in maintaining order. The one permanent solution would seem to be some sort of corporative state which would lessen the laborer's sense of grievance, and at the same time abolish altogether the license too often accorded him to conduct private wars not unlike those of feudal times. Some fine day the United States will awake to the idea that government should really keep the peace instead of maintaining a cockpit within which groups of citizens are allowed to fight one another. External peace would be valueless if the continual threats to internal peace became only a little more serious.

Nor does the foregoing exhaust the list of matters on which the author's views are not altogether final. For instance, he is hazy on the historical origin of the mass army, and at the same time oddly confident that United States airplanes will never bomb hostile cities—except perhaps in reprisal.

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Happily, none of these debatable matters touches any of the book's main theses. Whatever we may think about Spain or the Guard or internal order, it remains solidly and unquestionably true that the national strategy of the United States is primarily maritime, and consequently a mass army is for us an unnecessary and inappropriate instrument. His third proposition—that the creation of such an army might well be a permanent threat to our liberties—if not as absolutely unassailable as the first two, is at least so obvious as to require but little argument. Moreover, these three truths are today of the utmost national importance.

THOSE who years ago undertook the intellectually easy but then unpopular task of demonstrating the virtual impossibility of the United States ever using the mass army presupposed by our National Defense Act, may congratulate themselves both upon the recent happy conversion of our authorities and upon the appearance of so doughty a champion of the wiser view as Major Eliot. ARMY ORDNANCE especially, which opened its columns to discussion of the prickly question, deserves the fullest and warmest praise.

To go over the well-worn subject once more: There exists no power or combination of powers with the naval and military strength necessary for landing a mass army on our shore. Our North American neighbors are weak, and Canada is conspicuously friendly. Therefore the chances of our ever needing a mass army for use on this continent are not worth discussing. Our South American friends need consider the possibility of invasion on a vast scale as little as we ourselves. They are protected by distance and by our fleet. Further, their slight average density of population makes it certain that any armies used within their borders will be of moderate size. Accordingly, an American mass army must be intended for use either in Asia or in Europe. Since millions of armed men are about as likely to be transported across the immense distances of the Pacific as they are to fly to the moon, and since hardly any conceivable war would necessitate our sending such numbers westward, Asia is ruled out.

As a part of the greatest maritime coalition in history we did indeed ship nearly two million men to Europe in 1918 and could have sent more, but we did so across an ocean completely commanded except for a few German submarines. But the effort was enormous and the fruits of victory were not such as to encourage repetition of so vast an adventure. Consequently what we need—as Major Eliot, quoting Washington, justly observes—"is not a large army but a good one." And again, in the execution of any purpose for which we may reasonably expect to use land forces, "there is all the difference in the world . . . . between an army that cannot bring its full force into action for thirty . . . . or sixty days and an army which can strike *now*."

The numbers we require he calculates as follows: Great Britain we may neglect inasmuch as she has only a small regular army and lesser resources than ourselves for raising citizen troops. No other power or combination of powers could assemble more than 2½ million gross tons of ocean-going merchant shipping with which to transport troops and supplies in order to invade us. "The usual allowance for the sea transport of troops is one man for every four gross tons, plus an equal allowance for guns, motor transport, animals, and the normal supplies carried in corps and division trains. To this total, for a great overseas expedition, must be added a fifty per cent allowance for aircraft, base equipment, special landing devices such as armored barges, movable piers, cranes, etc., and reserve stores and ammunition. The full force that might possibly be brought against us is, therefore, in the neighborhood of 200,000 combat troops." Consequently, considering the many advantages enjoyed by troops fighting in their own country against an overseas expedition supplied and supported only by ships, "we require mobile ground troops numbering 150,000 to 200,000." Aircraft construction looking toward a total of 2300 planes he considers sufficient, nor can he see the necessity for a "2-ocean navy." The contrast between such rational views and the alarmist nonsense too often heard at this moment is refreshing indeed.

MAJOR ELIOT strongly reënforces his main truth with a number of important auxiliary or supporting truths. Thus he very sensibly estimates that under present conditions "Germany is not . . . . going to engage in any war, if she can help it, which she does not feel morally certain can be decided . . . . swiftly. Her resources in trained reserves and raw materials are wholly unequal to a long . . . . contest." Thus Germany or Germany and Italy together, as against England and France, must hope to win quickly or not at all, and such a victory we could not be in time to prevent. Indeed this passage of his might be considerably expanded without exaggeration. Centuries of Prussian history support Belloc's words: "The Prussian steel is cold, and Prussia never fights unless she thinks herself certain of victory." Moreover it is not only Germany which today has reason to fear a long European war that would be certain to strengthen the forces of social disorganization everywhere. It would be poor consolation if Russia under the strain of such a war ceased to be Communist.

Again the author judiciously stresses the enormous cost of air work, the obvious limitations of airplanes, and the consequent necessity both for battleships and for a reasonable number of good ground troops. Quoting some recent testimony by Rear Admiral Cook, Chief of the Bureau of Naval Aëronautics, he shows that 15 battleships like the NORTH CAROLINA, costing together about a billion dollars, can deliver within an hour as much fire effect as could be delivered by 6750 bombing airplanes costing together 2 1/3 billions. Given the longer life of battleships as compared with airplanes, in twenty-six years the bombers would cost seven times as much as the ships. Moreover, for strictly military purposes alone, the 6750 bombers would need a personnel of about 100,000 as compared with 22,500 for the 15 battleships. Hardly anything is more desirable in contemporary military thought than to appreciate the value of air work while realizing the fantastic improbability of the extremist claims made for it. So far, no actual test of aircraft has come anywhere near substantiating those fairy tales.

To digress for a moment: To date, the ascertainable facts about air bombing invariably have been the same. A certain article contributed to the *Naval Institute Proceedings* by an American naval officer serving in China, reported it to be a current joke among foreigners there that it costs the Japanese air force a thousand dollars to make a hole in a building which the Chinese can repair for two Mex. In Spain, Barcelona in its clear Mediterranean climate with an annual average of over 2500 hours of sunshine was repeatedly bombed from bases nearby. Harrowing tales of its almost total destruction were printed. At the same time, careful

observers noted that the principal bombing objective, the port, was never closed, and when the city fell, the rest of the place was found almost uninjured. All of which was exactly what happened in 1918. On both sides the damage done by bombing was microscopically small. That very gallant gentleman, the late General Billy Mitchell, speaking with obvious sincerity and good faith, would time after time report that his airplane had "destroyed" such and such a village. One would have expected to find the place in question leveled to the ground, but when the American troops arrived there, its buildings would be standing practically unscathed.

RETURNING to Major Eliot, not the least of his merits is his estimate of what would probably happen in the unhappy event of a war between the United States and Japan. To call such a conflict "The Impossible War," as he did not long ago in a magazine article, is, alas, going too far. But in this book he most certainly shows it to be about the silliest possible war which any two powers could fight. Given moderate American preparedness and vigilance, Japan's chance of forcing a decision upon us would be too small to discuss. The imaginary Japanese invasions of Pacific North America he dismisses with the silent contempt which such hobgoblins deserve. He writes: "The defense of the Hawaiian Islands is based on the fortress-island of Oahu, which is the strongest maritime place of arms in the world. Singapore is nothing beside it." Such a statement is a welcome contrast to the floods of British and other foreign propaganda which inundate our press.

On the other hand, in the unlikely event of our thinking it worth our while, we probably could get a decision over Japan. No invasion would be necessary; the successful establishment of a naval base near enough to permit interference with Japan's essential sea communications would suffice. But even this would be an enormously long and costly job, so that the rewards of victory would be far less than the sacrifices necessary to obtain it. It would be interesting to have the author's view as to the recent and much-disputed proposal to fortify Guam as a seaplane and submarine base.

Be this as it may, in his book he insists upon the unlikelihood of Japanese attack upon, or intolerable insult to, the United States if only we retain a margin of superiority in naval strength.

Panama he correctly judges to be the sensitive point of our national defense, not that a prepared attack on a great scale need be feared—its remoteness from hostile bases protects it against that—but because a sudden raid, coming by surprise, might inflict considerable damage on the Canal.

Certain of his chapters constitute a clear and adequate introduction to, or primer of, military policy. Thus he explains to his readers the interdependence of national policy and military policy—military policy taking its orders from national policy whose purposes it serves but in its turn influencing national policy, since no nation can act independently when at the mercy of superior might.

His paragraphs on force as the final arbiter of world affairs perhaps stress a little too much the collapse of the League of Nations. That collapse was more a symptom than a cause of our international anarchy, the main cause being the general preference for national and class ideals instead of international ideals. One might also mention the defective treaties of 1919 which irritated and humiliated the Germans while leaving them the means for revenge by maintaining the political structure of Bismarck's Prussianized Germany substantially intact. Thus Versailles fell between two stools: it neither reconciled the Germans nor did it destroy the basis of their strength. The treaties in question also sought to confine the intelligence and virility of Italy within too narrow bounds. Moreover, the attempt to freeze national boundaries forever was bound to fail, so that the Genevan talk-shop was doomed from the first.

Only a respected authority with vast armed forces at its command might have imposed peaceful changes, and the League was at no time either powerful or respected. When statesmen availed themselves of it at all, they did so purely for its usefulness in furthering their own national interests. Nor was the League intended to abolish war. It was designed merely to change the form of conflict by making neutrality impossible, so that every war would be a world war. Of course this was expected to make wars less frequent, but that was all. Thus even if the League had succeeded, the author's conclusion that force is still the arbiter of human affairs would remain sound. Indeed he might have trotted out the familiar argument from policing, for if people have the right to defend themselves or if the state has a right to defend its citizens against ordinary criminals, so much the more must individuals and states have the right to defend themselves against attack by organized forces.

A CHAPTER introduces the reader to the economic factor in war with reference to our essential resources, or, to take the phrase used in Brooks Emeny's classic study of the subject, the strategy of raw materials. While we remain a food-exporting nation, the author's concern over a possible future food shortage seems not too strongly founded. Even should the unhappy trend of our population into cities go to so fantastic a length as to lead us to import essential foods during peace—which may God forbid—still a nation like ours, with most of a fertile continent in its hands, quickly could provide for all its war-time needs.

In metals we are short of essential steel alloys, especially manganese which we import from Brazil, but here again the low-grade manganese ores we possess at home might be made useful should need arise. If our rubber supplies from the East Indies were cut off, the enormous stocks currently kept on hand would defy a long blockade. Our weakest point in military economics would be the insufficiency of our merchant marine, and the worst thing about our merchant marine is the shameful state of discipline among its crews. The author's strong words on this subject are all too well justified. Hardly anyone who has traveled on American passenger ships has not had experience of inefficiency and confusion, if not worse, among the crew. Indeed many of us prefer not to travel on American ships for fear of what might happen in case of a bad accident. Nor are matters said to be much better on the cargo carriers. The situation is one which calls for strenuous remedies.

As to the Navy, the author's views are moderate and sound. He stresses the combination of efficiency and economy to be obtained from a "balanced" fleet deficient in no essential type of ship, and also from a regular, steady program of replacement as compared with spurts of building followed by periods of inactivity. His ringing words of praise for the high tradition of enterprise and gallantry

characteristic of those who man our fighting ships make good reading because they are true.

REGARDING Army personnel he says—with marked understatement!—that if his modest program for our land forces were adopted "there need be little increase in officers." I should think not! Should his ideas be carried out, our present top-heavy officers corps would at any rate have a better chance to practice the primary duty of an army officer, which is service in command of troops.

As to the important question of improving the quality of Army personnel, he emphasizes the need for making an Army career sufficiently attractive in regard to pay and promotion to attract good and reasonably ambitious men. The complex and vital matter of promotion he would solve by combining the present method of promoting all company and field officers in accordance with the slowly moving but unvarying escalator of seniority with a system of selective promotion. In that connection, a little analysis of the successful prewar German selective system would not have been out of place. There the selectivity worked both ways. The avenue for advancement was the passing of certain examinations and tests leading to eligibility for the General Staff Corps. At the same time, laggards were spurred on by the possibility of compulsory retirement before the age limit should they or their commands fail to come up to standard. Thus an officer from the Inspector General's Department might knock unannounced on Colonel von Miller's or Major von Schmidt's door in the small hours of the morning and order their units to be turned out under arms and in full marching order in the shortest possible time. If the outfit performed badly its commander was that much nearer an undesired place on the retired list. After all, an adequate system of discipline should include punishments as well as rewards.

The book makes an interesting suggestion that Army officers should rotate between different sorts of duty as Navy officers do. The Navy officer rotates "between deck, engineer, and communication duties as a junior officer; . . . likewise . . . between battleships, cruisers, destroyers, submarines, and in some cases, aviation. The Marine Corps officer, by the time he becomes a colonel or a general, has served ashore and afloat . . . with infantry and artillery units and ships' batteries.

"The Army might . . . . well . . . . adopt a similar principle. . . . Every infantry lieutenant might be required to spend six months or a year as a battery officer of field artillery and a similar period with attack aviation. His infantry duties should take him into a rifle company, a machine-gun company, a tank company, and a battalion staff. Field Artillery officers might similarly be required to serve with the Infantry and perhaps with observation aviation. Air officers should spend some time with the various ground arms which they must support. Coast Artillery officers should rotate between harbor defense, antiaircraft and heavy mobile artillery; a few months with the Navy and with aviation would do them good.

"Every officer, under this plan, on reaching the grade of captain, in which he may be assigned to the command of a company, troop or battery, or to a regimental staff, and may in war be called to the command of a battalion, would find himself not only with theoretical but practical knowledge of the other arms with which his unit would be associated in battle. The unifying effect, the elimination of friction, would not be the least valuable feature of such a plan. The writer well remembers occasions during the World War when, as a company and battalion commander of infantry, he expected of the supporting artillery accomplishments which were wholly out of reason; his reaction thereto being in his youthful ignorance a feeling, which sometimes found vocal expression, that the artillery was not up to its job."

The author by no means neglects the subject of ordnance, arguing forcibly in favor of increased stocks of weapons and ammunition, also in favor of "educational orders" so that industry may have experience in manufacturing certain critical items of military supply, the want of which seriously delayed our munitionment in 1917-1918. Like every other intelligent and fair-minded man, he sees that the much-belabored munition makers would play an important and indispensable part in any serious military effort. As he notes, in the Meuse-Argonne fight, our artillery alone fired more than 4 1/5 million rounds.

FINALLY, Major Eliot appreciates a fundamental point which is only beginning to receive the attention it deserves; that is, the relation between military institutions and the political and social order. Borrowing the cumbrous jargon of the day, we might call it the sociology of war. Perhaps, since not only war but also peace-time military institutions are in question, one might call it the sociology of arms. Briefly, our real object in making war would be to defend our liberties, and yet the use of a mass or horde army automatically compels a total suspension of those liberties. Especially in a time like our own, such a suspension might mean their permanent loss. Why, therefore, he asks, "should we go to war to defend freedom if we must begin by destroying it with our own hands?" This question is the climax of the book. According to the way one answers it, the author's argument stands or falls.

Since "the military institutions of free peoples" form the subject of one chapter, one might perhaps wish for just a little more precision and definiteness as to what constitutes a free people. We are not told whether "freedom" means such tangible things as personal liberties or to what extent it is only the many-sided abstraction called political liberty. For instance, while the Prohibition Amendment and its accompanying laws stood, the citizens of the United States were legally less free in the important and intimate matter of diet than the people of any other civilized country.

Major Eliot's "free peoples" are a motley lot, including aristocratic England under her puppet King, France where the politicians of the Third Republic are everywhere distrusted and despised, "republican" Spain with its deplorable habit of murdering political opponents, and so on. He even speaks of the "free democratic institutions" of the United States, although the Federal Constitution was designed for the express purpose of curbing democracy and still goes a long way toward doing so. We elect our President not by popular vote but through electors apportioned by states; each state has two Senators irrespective of its population, and a tiny minority controlling thirteen states could at any time veto an amendment of the fundamental law. It could of course be objected with some justice that military writers need not be purists in the matter of political terms but should be allowed to avail themselves of those in common use. To this however the present writer would reply that

words like "democracy" and "freedom" are today so vaguely used that if we are content with them as mere slogans we might some day find ourselves fighting not for our own benefit but for the benefit of international bankers or international Reds.

Nevertheless, the author effectively proves his main point. His proposed military policy, basing our national defense on our Navy supported by an Army of moderate size, would indeed give us security without the total loss of our liberties in war time, while the recruitment and supply of a mass army would destroy those liberties at least for the duration of the war. And this no matter how one defines freedom.

IN SUPPORT of this contention he has only to cite the proposed laws already drawn up—"laws which require only the insertion of a date and a few details to be presented to a Congress fired with a war spirit, perhaps blinded by war hysteria; laws which would take away the individual rights and liberties of every American citizen and convert this country, in a single day, into a totalitarian dictatorship, under the sole control of the President for the duration of the 'emergency'."

These proposed laws are all intended to carry out the principle of the so-called universal draft. Three of them are annexed to the Industrial Mobilization Plan. Of these, the first provides for drafting man power for military service—sound enough in principle whenever a colossal military effort may become necessary. The catch, of course, is in the word "necessary." Another gives the President power to fix wages and prices, license or prohibit any industry, etc. In short, it makes the President an absolute dictator of all economic life. Other sections give him the power to suspend certain laws of the United States which may in his opinion "restrict or impede the procurement activities of the Government or the successful prosecution of the war." A large blank space has been left in the bill for the insertion of the name of any or every law destined for war-time cold storage.*

As if this were not enough, there is also the May Bill, named after the present chairman of the Military Affairs Committee of the House of Representatives, which goes even further than the Industrial Mobilization Plan and includes "wage and price fixing, the regimentation of all labor, the registration of all those engaged in industrial management, the licensing of all business." In addition there is Senator Nye's bill, chiefly concerned with taxation and the elimination of war profits, but in its field more sweeping than the May Bill in that it empowers the President to spend public money without accounting for it until after the war.

All these assume another war like the last, including a mass army of millions and a straining of every national resource. On this basis they or something like them are not only necessary but inevitable, but only on this basis. Short of the maintenance of a mass army, far less rigid and less extensive controls will suffice.

We should indeed pass an inclusive draft law as soon as war is declared, but since under the author's plan huge numbers will not be required, it would be enough to pass it and then hold it in reserve, meanwhile availing ourselves of volunteers. The passage of the draft law would reaffirm the universal obligation of citizenship while volunteering would probably provide all the men required. As to supply, an "industrial protective plan" much less grandiose than the Industrial Mobilization Plan would suffice.

Further, the maintenance of the Johnson law forbidding foreign governments from borrowing in this country in war time would prevent our industry from becoming top-heavy with foreign war orders as in 1917. The author characterizes that law as "wise and just" and the present writer heartily agrees.

The dangers against which Major Eliot warns are all too real. Every day the propaganda machines grind out a new argument in favor of abandoning our own business and turning our back upon our many domestic problems in order to lead another crusade for forcing democracy down the throats of other peoples who obviously do not want it, for rescuing empires which ill deserve our sympathy, and in general for playing the Meddlesome Matty of the universe. Every day we are told that if Europe again goes to war we *must* be drawn in whether we like it or not. Against all this the author reminds us that there is no "must" about it. Secure behind our oceans we need fight only if we choose, for no one can successfully attack us. If we cannot keep the peace for the world, we can at any rate keep it for ourselves and for our own continent. Only by plunging into foreign adventure can we destroy the security with which Providence has blessed us.

NOR is the danger of destroying freedom at home by an excessive war effort less threatening than the folly of unnecessary adventuring abroad. Three quarters of a century ago when the average American family owned productive property, our personal liberties were secure because the economic independence of our citizens was unquestioned. Then Lincoln could govern dictatorially during war time, proclaiming martial law and suspending habeas corpus, without permanently endangering freedom. The accusation that he was threatening it he could wave aside with his famous saying: "Invalids need aperients and emetics but no one ever gets a taste for them." But today we have created a propertyless proletariat of millions who must take their orders either from the private owners of industry or from some Government relief agency. Cringing under the lash of unemployment, our proletarians demand not freedom but security. If we put them again under the totalitarian discipline demanded for the support of a mass army there will be no such automatic return of our civil liberties as in 1865. The war against Germany left us with the vile legacy of the Prohibition Amendment. What legacies of tyranny might not another such war leave in its train as permanent after effects?

Those who would have the United States again pour out blood and treasure in defense of the French or British empires will take little comfort from Major Eliot. Those who would have us rescue the Czechs or the Chinese will lay down "The Ramparts We Watch" with a sigh. The popular success of this admirable book will leave them cold. Those who would have us mind our own much-neglected business at home will thank God and take courage.

*EDITOR'S NOTE.—Inclusion of these drafts in the legislative annex to the Industrial Mobilization Plan was not so much of military origin as it was of congressional demand. It is interesting to note in connection with the legislative annex that the bill proposed is based on House of Representatives Bill No. 5529 (1935). This bill was considered by several congressional committees and favorably reported, after amendment, by three Senate committees—Military Affairs, Finance, and Munitions. The genesis of the thing was in the hysteria created by an alleged investigation of munitions makers. Hence to judge the Industrial Mobilization Plan in so far as its legislative annex is concerned, one must take into account the temper of the times when the last revision of the text was published in 1936. Indeed, the value of the plan, as a plan, is mainly in its adaptability to periodic revison of method and text to meet changing conditions.

Horsepower in the Army

Wide World

A MODERN 75-MM. HOWITZER ADVANCING TO SUPPORT THE ATTACK IN MANEUVERS OF THE 1ST CAVALRY DIVISION

Wide World

WITH GAS MASKS FOR MEN AND HORSES, A MACHINE-GUN UNIT GOES FORWARD THROUGH A PROTECTIVE SMOKE SCREEN

"And the Caissons Go Rolling Along"

Wide World

ILLUSTRATIONS on this and the opposite page show the recent cross-country maneuvers of the Army's only Cavalry division—the 1st Cavalry—at Fort Bliss, Tex. Although motorization has resulted in the development of light tanks, armored cars, and scout cars to supplement the distant scouting of airplanes, horse cavalry and light artillery—due to their extreme mobility—still are essentials of military effectiveness. Armed with rifles, pistols, and machine guns, cavalry has the greatest fire power, man for man, of any fighting unit. It can get this fire power on the battlefield three times as fast as the man on foot. It can negotiate terrain where motorized and foot soldiers cannot go. At the end of the World War, General Pershing stated that "there is not in the world today an officer of distinction, recognized as an authority on military matters in a broad way who does not declare with emphasis that cavalry is as important today as it has ever been." It is the consensus of military opinion that no existing mechanical device can take the place of the horse for certain difficult missions where characteristics of terrain make it impossible for machines to operate. The essential elements of the unit are the man, the horse and the weapon. The combination of horse soldiers, armored vehicles and horse-drawn artillery makes the most flexible and effective fighting team in the remaking of modern armed forces.

Training Apprentice Machinists

The Frankford Arsenal Method for Developing Skilled Personnel

By Lieut. Col. Levin H. Campbell, Jr.*

UPON the request of the editor of Army Ordnance, this article is presented in the belief that a description of the method used in the training of apprentice machinists as employed at the Frankford Arsenal may be of interest and possible application to other establishments. Until recently, the systems of apprentice training have consisted, in general, of assigning a young man as helper to a trained machinist. At the end of a given time, usually four years, he was rated as a journeyman if his services had proved satisfactory. Such systems, of course, varied greatly in their effectiveness, as so much depended upon the skill and patience of the individual machinist to whom the young man may have been assigned. We know of many instances where, under such procedure, apprentices spent a rather large proportion of their time in the capacity of laborers or messenger boys, to the detriment of their training.

In more recent times, apprentice schools have been organized in large industrial plants, and a strict curriculum has been followed exactly as is done in any other well-regulated school. Highly competent instructors are assigned to the teaching staff, and effort invariably is made to equip the school with the most modern machine tools and to follow the most modern methods. In these schools we find no haphazard and uncoördinated training. It has been our earnest attempt to pattern the school at Frankford Arsenal after similar schools to be found in our most progressive industrial organizations.

A complete single-story building of approximately 11,500 square feet was assigned by the commanding officer for the use of the school. The building, first of all, was put in the best of condition and adequate lighting was provided. Approximately three-quarters of the floor space is occupied by machine tools and equipment. The remaining quarter is used for a combined classroom, drafting room, and recreation room. Unfortunately, funds have not permitted the purchase and installation of more than a very few modern machine tools. The remainder were taken from those not in use at the arsenal. However, as will be mentioned in further detail below, these machines were put in the best of condition.

When this school was started in the fall three years ago, a number of boys certified to us by the Civil Service Commission were interviewed, and of this number some thirty-one were selected. The greatest care was exercised, within the limitations of Civil Service rules, to select only those boys who appealed to us as being the most likely prospects. Within the six months' probational period, this number, in fairness to the Government and to the boys, was reduced to twenty-three. Obviously, everyone has not the same aptitude for mechanical work. We have stressed that we not only are trying to train these young men to be excellent machinists and toolmakers, but, in addition, we have hopes of developing a fair amount of men with sufficient qualities of leadership to become successful foremen.

AFTER the boys had reported for duty, their first assignment with their foreman was to completely disassemble every machine tool within the school building. Replacement parts were quickly procured where such were found necessary and the machines reassembled and painted. The object of this, obviously, was twofold—to teach each boy what made the machine operate, and secondly, to put the machines in a condition where accurate work could be expected. The class then was divided into groups or squads, each assigned to a particular class of machine, and their training was begun by having them do fundamental machining operations on scrap material. At the end of the first month, these rudiments governing the operation of the machines and simple set-ups had been inculcated. The class then was ready to undertake actual production work assigned to it by the various departments of the arsenal. Such work was of course, at first of a very simple nature, but each month has seen the young men successfully turning out increasingly difficult parts made to exacting tolerances. It was indeed very gratifying to have a set of dies and punches for use on an upsetting machine, used in connection with the manufacture of shell forgings, produced by boys of the first class while in the second semester of their second year. In order that the training of the first two years may be understood, a list of group assignments is given below.

FIRST YEAR

Lathes.—Fourteen weeks are spent learning the following: centering, chucking, straight turning, rough and finishing, facing, drilling, tapping, counterboring, cutting tapers, threading, undercutting and form turning, the use of verniers, inside and outside micrometers, snap and plug gages, thread and ring gages.

Millers.—Nine weeks are spent in plain, horizontal, and vertical milling; gang, side, facing, end, T-slot and circular milling; the use of the vise, parallels; selecting cutters; use of fixtures and dividing head.

Shapers.—Three weeks are spent studying the use of the vise; the proper feeds, speeds, stroke; kind of tools required and the grinding of them for rough and finish work; cutting angles, squares, forms, and slots.

Benches.—Four weeks are spent in the use of the file, chisel, and scraper; use of the surface plate, height gage and Johansen blocks; laying out work; fitting and assembly of work; the use of the bench lathe and bench drill press.

Planers.—Two weeks are spent in setting up work with proper clamping to avoid strains; on rough and finish flat surfaces; cutting angles and T-slots; in the use of the surface gage; in the selecting and proper grinding of tools.

Boring Mill.—Two weeks are spent studying the proper clamping of work to machine; boring; speeds and feeds; setting up of tools; rough and finish boring; facing, angles, and reaming.

Slotters.—One week is spent learning the setting up of work, setting length of stroke and using proper speeds and feeds; grinding and forming of tools; forming and cutting squares, hexagonal and round holes, slots, and facing with the use of the circular attachments.

Grinders.—Three weeks are devoted to selecting types of wheels for work with regard to finish; wet or dry grinding, truing of work; the use of dial indicators; fixtures and gages; allowance for fits; flat grinding, internal grinding, and form grinding.

Mechanical Drawing.—Four intermediate weeks are spent determining the scale to be used on drawing; the showing of views; making

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APPRENTICE SCHOOL, FRANKFORD ARSENAL—THE MACHINE SHOP

full-dimensioned drawings; sectionalizing parts; studying the use of the protractor, engineering scale, and slide rule; making rough sketches in the shop and preparing drawings.

Drill Press.—Two weeks are spent learning the following: layout of work, jig work, boring, counterboring, spot and back facing, reaming, tapping, the use of multiple-spindle machines, names of drills, grinding of drills, determination of drilling speeds and lubrication, drill allowances for reaming, selecting drills for tapping, and hand and machine tapping.

Auxiliary Shops.—A total of aproximately three weeks are spent in the hardening room (small-arms), foundry, pattern shop, and laboratory.

Hardening Room.—Identifying steel by sparks; using various heats for steel with different carbon contents, whether oil- or water-hardened; determination of annealing point on steel; reading of pyrometers, Rockwell and Brinnell machines, and file testing of steel.

Pattern Shop.—Laying out work on board; manner of parting patterns for cope and drag; determination of draft on patterns; the use of shrink rules.

Foundry.—Composition of various types of bronze, brass, and aluminum; the use of core boxes and cores; the use of patterns in making molds; the mixing, melting and pouring of metals.

Laboratory.—Physical testing of specimens; polishing and etching of specimens for photomicrographs.

SECOND YEAR

Lathes.—Twelve weeks are allotted to the lathes doing advanced work: centering, chucking, turning, facing, drilling, tapping, boring, counterboring, and threading. This includes two weeks on the Monarch-Keller lathe, doing form turning and relieving threads and also includes the use of all precision measuring instruments adaptable to lathe work.

Millers.—Eight weeks are allotted to the milling machines doing plain, horizontal, and vertical milling; gang, side, facing, and T-slot milling. Three weeks of this time are spent on a light type Brown & Sharpe milling machine doing advanced milling work, including the use of the vertical head, slotting attachment, and circular milling table.

Shapers.—Three weeks are allotted to the use of the vise, proper feeds and stroke, types of tools required, and the grinding of them for rough and finish work; various types of metal; cutting angles, squares, forms, and slots.

Boring Mill.—Two weeks are devoted to the setting up of work, the proper use of clamps, the grinding and setting of tools for finish boring, facing, and reaming.

Slotters.—Two weeks are spent setting up work, setting length of stroke, using proper feeds and speeds, and grinding tools for form cutting—squares, hexagonal and round holes.

Grinders.—Four weeks are allotted to selecting the types of wheels for work with regard to finish for wet or dry grinding; truing of work; the use of dial indicators, fixtures, and gages; allowance for fits; straight and form grinding.

Mechanical Drawing.—Four weeks are allotted to laying out of work, detailing and assembling, the use of gages, tools, etc.; sectionalizing parts; the use of the protractor, engineering scale, and slide rule.

Pattern Shop.—Two weeks are spent studying the laying out of work on board, manner of parting patterns for cope and drag, determination of draft on patterns and the use of shrink rules.

Foundry.—Two weeks are spent learning the composition of the various types of bronze, brass and aluminum; the use of core boxes and cores; the use of patterns in making molds, and the mixing, melting, and pouring of metals.

Hardening Room.—Three weeks are spent in the identification of steel by sparks; using various heats for steel with different carbon contents, whether oil- or water-hardened; determination of the annealing point of steel; reading of pyrometers, Rockwell and Brinnell machines, and file testing of steel.

Laboratory.—Two weeks are spent in the physical testing of specimens; polishing and etching for the photomicrograph.

Welding Shop.—Two weeks are spent learning the use of the torch, the cutting of metals, the welding and brazing of aluminum, brass, bronze, steel, and cast iron.

Plating Shop.—One week is spent in cleaning metals by acids and plating; learning the use of anodines in connection with chrome plating, nickel plating, copper plating, parkerizing and cadmium plating steel.

Jig Borer.—One week is allotted to setting up of work, laying out, drilling, boring, tapping, and reaming.

Inspection.—One week is spent in the use of percussion measuring instruments, and the inspection of various types of work.

FOR the first two full years the training of the young men is confined entirely to their work in the school. This work includes not only training in machine-shop operations, but also includes one month of drafting work for each boy during each of the two years. While, of course, we are not trying to make draftsmen, we have succeeded in training the young men in the accurate and quick reading of drawings. We know of no better way to do this than by having the individual make the mechanical drawings of increasingly intricate parts; such as, gages, jigs, fixtures, and tools. As is to be expected from any group of high-school graduates,

APPRENTICE SCHOOL, FRANKFORD ARSENAL—THE CLASS AND RECREATION ROOM

surprisingly good talent in the draftsman's art has been discovered and developed.

In addition to this training, we have set up a class for shop mathematics from October to June, which is conducted for 1½-hour periods two afternoons per week, starting at the end of the working day. We have secured a high-school mathematics instructor of some years' experience who has taken a real interest and enjoyment in training the young men in the use of figures and in more advanced instruction in the mathematics which they will use later as machinists and as foremen. For the boys who do not desire to attend our school, we require attendance at one of the many excellent evening schools in Philadelphia. Their reports must be submitted to us, and even though such a school is attended, the boys must take our monthly examination. Thus we are assured that all the youngsters receive a thorough foundation in mathematics, as applied to shop practice.

At the end of each month, the boys are rated as to their efficiency and are so arranged on a list which is posted on the school bulletin board. This, as may be imagined, acts as a very strong stimulus to those who find themselves at or near the bottom of the list. The subjects from which the monthly ratings are compiled are weighted: shop work, 3; drafting, 1; shop mathematics, 1.

During the last half of the second year, lectures covering the various subjects met with in shop administration and shop practice are given by the head foremen of the various departments of the arsenal. These talks have been held on the high plane of "father-to-son" type, and have been of great help to the apprentices. Also, during this period, the boys are taken by their foreman to various industrial plants within the Philadelphia area to permit them to see other lines of mechanical endeavor and thus widen the scope of their training. In the middle of the second year, six weeks are devoted to group instruction in various semirelated activities of the arsenal; such as, pattern shop, foundry, laboratory, welding, etc. Familiarity with the operations of the entire arsenal is thus imparted.

At the end of the full two years of instruction in the school building, the boys are divided among the three major departments of the arsenal and assigned to machinist's work for which their training qualifies them. During these last two years, each department officer is required to submit a quarterly rating report covering the nature of the work on which the boys have been engaged and the character of their services.

The class which started in the fall of 1935 is now in its fourth year, and the progress of the boys has indeed been most commendable. At the end of the full 4-year apprenticeship, it is the intention to absorb the young men into the organization as machinists. Unfortunately, due to lack of equipment, it was not possible to start a class in the fall of 1936. An additional class, however, of fifty-four boys was enrolled in October 1937. At the end of the period of probation, this number, due to lack of aptitude and other causes, had been reduced to thirty-seven. In October of 1938, a small class of eleven boys was started, which, for the reasons just stated, now numbers six. The thought underlying this was to have a nucleus to assist in starting the large class which will be taken on this coming fall. Obviously it would be more desirable to have each class approximately the same strength, but again, lack of equipment precludes having more than a certain number within the schoolroom.

THE young men have formed an apprentice association with elected officers. The association engages in various social activities, such as dances, dinners, and athletic contests. The morale and *esprit de corps* of the organization are of the highest. Working with this splendid type of boy has given us not only pleasure, but full satisfaction in the thought that we are establishing these young men firmly in life, and at the same time are contributing in no small part to the future successful operations of the arsenal.

EDITOR'S NOTE.—This article supplements one by the same author in the preceding issue of this journal. In the March-April issue (Vol. XIX, No. 113, p. 273) Colonel Campbell described the methods in use at the Frankford Arsenal for the production of artillery ammunition. This system and its description in these pages have aroused the interest of production engineers throughout the country. It is to be hoped that similar concern for the training of apprentice machinists will result in more general public education of the men behind the men behind the guns. Likewise, it is to be hoped that apprentice training as conducted at other arsenals and possibly at some of the larger vocational schools will be described in these pages. From a national security standpoint, internally and externally, the subject is of first importance!

The 75-mm. Gun

The Past and Future of a Famous Artillery Weapon

By Capt. S. L. Conner*

THE design of a piece of ordnance is inextricably bound up with the art of its use. So far, no one has produced a method of making music much superior to drawing horsehair over catgut strung tightly over a wooden box, and no one has produced a better divisional artillery weapon than a 75-mm. gun supported on a pair of wheels. But, as with the violin maker and the musician, the line of coöperation between gunmaker and artilleryman is not easy to prescribe. In this day and time, the artilleryman is supposed to specify the armament he wants and the gunmaker to build to the specifications. This situation is analagous to expecting the musician to instruct the craftsman—a situation which, in music, is not practical. In artillery, this method of coöperation has been the practice for the past two decades and has produced the results we see today.

THE MODERN 75-MM. GUN CARRIAGE M2
In Firing Position, 45 Degrees Elevation, Trails Spread 90 Degrees.

For a brief review of the current status of the 75-mm. gun, it is proper to start with the situation existing at the close of the World War. The divisional gun artillery in existence consisted of a considerable quantity of M1897, M1897MI, M1917, and M1916 75-mm. guns and carriages. The M1897 and M1897MI were the well-known French 75, the M1917 was the British 18-pounder chambered for the 75-mm. ammunition, and the M1916 was the American 3-inch on a split-trail carriage, similarly chambered.

Under date of May 5, 1919, the report of the Westervelt Board was submitted. This report made an effort to lay down military characteristics for divisional gun artillery. It is of interest to note how the board set about this task which was (from par. 142. W.D. Special Orders No. 289-0, Dec. 11, 1918) "to make a study of the armament . . . . to be assigned to a field army." The board discussed the missions of division artillery, the types of light field gun that existed, including pertinent thought from many sources, and finally ideal and practical weapons for the equipment of the field army. A study of the report indicates the great difficulty inherent in an attempt to specify the military characteristics of a weapon. As well attempt to write the musical characteristics of a violin! However the board produced an excellent set of requirements. Briefly, it called for an ideal gun of about 3 inches in caliber, to throw a projectile of not over 20 pounds to a range of 15,000 yards, and to be mounted for 360-degree traverse with elevation limits of —5 and +80 degrees.

For immediate armament the board called for 50 per cent M1897 and 50 per cent M1916 development of the split-trail type of carriage, and provision for mechanical transport to a speed of 12 miles an hour as a maximum. Now these are good military characteristics, although numbers have little place in such specifications. However, since the board consisted of three general officers, two Artillerymen, and two Ordnance officers, the entrance of design figures into their statement of requirements was inevitable.

From this start, the development of the 75-mm. gun has advanced for twenty years. The Ordnance Committee has acted on some phase of the subject about four hundred times. Military characteristics have been written and rewritten. Mechanical transport with speeds up to 40, 50, and 60 miles an hour and better has developed. There are in the record 53 different designations for 75-mm. gun carriages, of which 20 are modifications to the matériel still on hand from the war period. This is activity from which results have flowed. These results may be properly considered under four main heads: (1) Adaptation for high-speed transport of the war types—M1897, M1917, and M1916; (2) The development of the 75-mm. M1 matériel; (3) The 75-mm. T2 and T3 development of the so-called "all-purpose" mount; (4) The development of the 75-mm. M2 matériel.

Sufficient 75-mm. gun matériel was left over from the war to equip a sizable army. And while the war types are far from the modern artilleryman's ideal, still they are serviceable weapons. The old artillery wheels were never meant to travel sixty miles an hour behind a light truck, and their replacement with standard automotive wheels and tires was an obvious requirement. The adaptation of the war types of 75-mm. matériel for high-speed traction is complete. With fine coöperation from commercial interests, standard parts

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form a large portion of the modification, and great progress has been made in getting the adapters actually produced and on the carriages of which they form a part. The limited traverse and elevation of the M1897 and M1917 types remain unchanged.

Well within the first decade after the Westervelt report, the 75-mm. M1 matériel was standardized. This consisted of a gun, fitted with a drop block, that gave a muzzle velocity of 2175 foot seconds as compared with 1800-1900 foot seconds given by the war types. Mounted on a split-trail carriage giving 45 degrees elevation and 45 degrees of traverse, this weapon had a maximum range of 14,880 yards. An effort to produce a carriage to mount either a 75-mm. gun or a 105-mm. howitzer was made, and failed, during this development. The M1 was a good answer to the board's requirement of developing the split-trail type of carriage, at the same time producing practically the range called for in the ideal. But more muzzle energy means heavier weights, and a wide traverse means longer trails, so this matériel weighed from 300 to 800 pounds more than the war types.

THE MODERNIZED 75-MM. GUN CARRIAGE M1897 A4
In Firing Position at Maximum Elevation.

Early in the second decade after the Westervelt Board report, the effort to produce the ideal divisional light artillery was made. Two types were built, known as the T2 and the T3, which ultimately resulted in the T2E1 design. Here was the artilleryman's dream: 80 degrees of elevation, 360 degrees of traverse, 14,880 yards range, susceptible to all kinds of fire, from direct laying to director fire against aircraft or other rapidly moving targets. The weapon could be rapidly set up from the traveling position to fire up to 45 degrees elevation with 90 degrees of traverse and, passing through a total of 5 possible arrangements for firing, could be set up in a few minutes for all-around fire. But, alas, the weight exceeded 4800 pounds, and compared to the rugged simplicity of the conventional gun carriage, these weapons were astonishingly complicated, at least in appearance. Moreover, of course, for director fire, all the impedimenta pertaining to antiaircraft fire control had to be available.

During the last five years, the effort has been to develop the split-trail type of carriage to mount a war-type gun. This has culminated in the M2 matériel which mounts the M1897 gun, modified to remove the rollers, the inclined plane, and the sweeper guide plate assembly, giving −10 to +45 degrees elevation and 85 degrees of traverse. The old gun with the best of modern ammunition will reach out 13,500 yards from this carriage. It is interesting to note that with about twice the traverse of the M1 matériel, and about 1400 yards less range, the weight of the M1 and M2 designs is substantially the same. The M1 uses an equalizer, and the M2 uses a jack support. This carriage, as also the T2, T3 types, was designed for high-speed traction, so the use of the pneumatic tire is not an adaptation to this mount but is an integral part of the design. The table on page 349 indicates the salient features of various types of 75-mm. gun equipment used by the Army.

This brief résumé of the development needs only a few more words to be complete. The self-propelled mount, or "motor carriage," was investigated, a few were built, and finally were abandoned. The M1 and the T2, T3 types were each, after preliminary test by the using services, produced in quantity sufficient to arm one battery. The procurement of the high-speed adapters for the war types is progressing, with the M1917 still in the picture, and about one hundred and twenty of the M2 type of matériel have been produced. A tabulation of the principal characteristics and photographs of the matériel with which the artillery will initiate its efforts in any future struggle appear on these pages. And this is good matériel. Certainly nothing exists anywhere which is superior to light divisional gun artillery. "The consensus of opinion of all artillery officers—French, Italian, English, and American—is that the 75-mm. gun . . . . firing a 15-pound projectile . . . . and having a range of not less than 11,000 yards is a satisfactory weapon at the present time for use with division artillery" (Westervelt report II (a) 14). If this quotation is still correct, then the American postwar development has been satisfactory. What, then, of the future?

THE current picture of the 75-mm. gun is broadly sketched above. It is to be noted that long range and wide flexibility were considered essential by the board immediately following the war, which considered the capacity of ponton equipment as the limit on weight. The modern demands of the using service require the sacrifice of other characteristics on the altar of light weight. This writing will not pretend to criticize or approve either the findings of the board or the current situation. It is proper to observe, however, that development of armament depends upon the statement of military characteristics. Today, as applied to the 75-mm. gun, it is correct to record that the weapon matches the requirements. It follows, then, that further development will depend upon the statement of further military characteristics.

It is true that a piece of divisional artillery could be designed without the statement of a requirement from the

using service. But the action would be contrary to precedent, not to speak of Army Regulations. A.R. 850-25 states in Section I, paragraph 5, "The chiefs of using arms and services are responsible for the initiation of requests for the development of equipment and military characteristics thereof." This same regulation, in Section II, paragraph 8 a, defines military characteristics as follows: "The term 'military characteristics' is defined as those essential qualities which an item of equipment must possess in order to fulfill a definite military purpose."

THUS, under the regulations, the using service is required to determine a definite military purpose. Having determined this, then the using service must discover the indispensable attributes of the equipment necessary to fulfill this military purpose. Section I, paragraph 4, of A.R. 850-25 outlines the responsibility of the supply arm in these words: "The chief of each supply arm or service will be responsible for initiating and conducting the development of new equipment." Thus, having the request containing the indispensable attributes (military characteristics) duly approved, the supply arm must translate these into a mechanical design. Mobility must be translated into wheels, tires, and weight. The ability to defeat a certain target must be translated into a caliber, a muzzle velocity, or a range of elevation and traverse. But the easiest way to describe a mobility is to prescribe a weight.

Thus the military characteristics of the using service and the design characteristics of the supply service become identical. Instead of laying down a requirement, the using service and the supply service translate that requirement into a design figure, which becomes the requirement. For example, if a certain degree of mobility is required, it is not prescribed. A written statement of a degree of mobility is extremely difficult to prepare, but a statement, based upon past experience, of tires, width of tread, road clearance, gross weight, etc., can be worked out. Such a statement has value; its requirements are definitely expressed in numbers; the product can be easily judged in its light. But such a statement is a design specification; it is information for the designer, not for the engineer. It is based upon past experience. This result has appeared in the development of the 75-mm. gun.

Yet it appears that nowhere in the world has much more been accomplished. The reason for this is the same fundamental reason as applies to the American results. It is impossible to describe the indispensable attributes that will be required of divisional artillery if it is needed again. It is impossible to predict the detailed future use of the divisional artillery. It is even impossible to predict the detailed organization of the future division! This is true because it is impossible to predict the locale in time or space, the tactics or the strategy of a future war.

THE MODERNIZED 75-MM. GUN CARRIAGE M1916 E1
Left Side, Showing Maximum Equalizer Action.

THERE exists divisional gun artillery for a sizable army. If it is called into use it will serve; it has served as well as the best the world has ever seen. If the circumstances attending on its use develop into a warfare of position, then the types exemplified by the M1 or the T2, T3 matériel will be built. If on the other hand the artillery finds itself in a war of movement—of high-speed transport and fast action—the call will be for lighter, more mobile weapons adapted to high-angle fire and the engagement of moving matériel targets at short ranges only—weapons such as the 75-mm. field howitzer. And perhaps this is also true. We should improve both extremes. The mount for all-around fire, equipped for long-range work against moving terrestrial and aërial targets with a gun of good velocity, should be constantly under study for improvement. The light, low carriage, with the stubby howitzer, designed for fire and movement always should be getting better and better. One of the two extremes, for which the standard weapon is a compromise, may be required. Perhaps, having an adequate initial supply of the golden mean, divisional artillery development should be directed into the path of perfecting the extreme types that will be required for the war of position on the one hand or the war of movement on the other.

CHARACTERISTICS OF 75-MM. GUNS

Gun	*Carriage*	*Weight* (pounds)	*Traverse* (degrees)	*Elevation* (degrees)	*Max. Range* (yards)
M1897	M1897A4	3015	6	−10+19	8,000
M1916	M1916A1	3210	45	−7+53	12,500
M1917	M1917A1	3160	8	−5+16	8,000
M1897A3	M2A2	3450	85	−10+45	13,500

Speed of transport—unlimited.

ARMY ORDNANCE

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Month by Month

WITH THIS ISSUE OF ARMY ORDNANCE WE extend felicitations to Willard R. Cox, assistant chief of the St. Louis Ordnance District. Mr. Cox is completing the first year of his tenure of office as assistant to Col. Harry Scullin, district chief, who is also a director of the Army Ordnance Association and a past president of the Association's St. Louis chapter. Mr. Cox filled a major rôle in arranging for the recent mammoth dinner meeting of the ordnance fraternity in St. Louis, a notice of which appears elsewhere in these pages.

It is a basic tenet of industrial preparedness, as that branch of national defense has evolved during the past generation under Ordnance leadership, that the direction of procurement planning for war-time needs be in the hands of industry itself. For this reason the chiefs of the Ordnance procurement districts throughout the country are, as they have been since the inception of the district system of decentralized procurement, outstanding leaders in the industrial and business life of the Nation. By this is indicated the stern intention of the Ordnance Department of the Army always to look to private industry and private industry's leaders for peace-time planning no less than war-time operation.

Mr. Cox fills these specifications most worthily; his place in the diversified industries of St. Louis is high. He is not associated with a type of business at all allied to armament—unless "the pause that refreshes" can be considered part of our man power fortification! He was chosen for this national-defense assignment because of business ability, high character and unfailing loyalty.

Hence ARMY ORDNANCE, in conformity with a custom of many years, signals out another of its civilian leaders as a type of American citizen upon whom patriotic responsibility has been placed. Mr. Cox and his Ordnance associates in St. Louis are an essential unit of industrial preparedness. For this he and they are entitled to the thanks of their colleagues. Speaking for this group, ARMY ORDNANCE hails the assistant chief of the St. Louis Ordnance District!

THE ARTICLE "TRAINING APPRENTICE MACHINists," by Lieut. Col. L. H. Campbell, Jr., Ord. Dept., U. S. Army, elsewhere in this issue, should perform two timely services. It describes the way in which the Frankford Arsenal is developing skilled personnel for its technical organization in the days that are to come. The method seems most exemplary; the results obtained are gratifying. Here in a Government establishment steps are being taken to replenish a dwindling supply of modern armorers in a technique which will die if the priceless ingredient—knowledge—is not nurtured. This is real achievement.

But there is a still larger service performed by Colonel Campbell's discussion. What he has written stresses, to our way of thinking, the urgent need for general apprentice training especially in our educational establishments. The problem to which we refer can be stated in the following lines, having in mind peace-time as well as war-time demands for skilled mechanics.

The greatly increased use of aircraft in military operations, the mechanization and motorization of ground troops, and the constantly increasing number of automatic weapons, tend to push back into the factory the point where our greatest military problems arise. Here a tremendous number of *skilled* mechanics are required not only for the manufacture of equipment but also for its maintenance and operation. The number of mechanics required for these services during the World War will be dwarfed by the military requirements of any future major emergency. Unless there are ample reserves of this man power—reserves, be it said, fully as important as war reserves of matériel—delays in the production of matériel will occur, mobilization will be retarded, field forces will be handicapped, national effectiveness will be reduced. Frankford and many of our vocational schools are thus pointing the way both to a problem and its solution.

The time is appropriate to stress the need for vocational training throughout the United States. During the past eight years many of our industrial corporations have been compelled either to reduce or eliminate apprentice training in the principal trades. As a result, the supply of skilled mechanics in this country is becoming more limited. Industry is experiencing a shortage of good mechanics qualified for maintenance purposes, a lack of tool and die makers, and of men equipped for promotion to minor supervisory positions.

The situation is the more distressing because the material with which to work is at hand. There are many young men in this country who have finished high school who now walk the streets of our larger cities seeking employment. Their mental attitude is one of embitterment toward an educational system which has helped to create the condition with which they are confronted. To solve their problem by making of them skilled mechanics is also to solve a problem of major educational, civic and social importance.

Here should be the opportunity today throughout America for young men to learn useful trades to fit them as skilled mechanics. Private industry is handicapped in offering apprenticeships. The National Committee on Apprentice

Training through its high welfare standards makes remote the possibility of industry reëstablishing apprenticeships on the predepression scale. Private technical schools teaching crafts and trades require tuition fees which, although generally reasonable enough, are beyond the means of unemployed youths. The problem of providing facilities for educating larger numbers of young men to use their hands to produce the necessities upon which our national life is founded is a problem of education and social welfare. We must begin now to teach youth how to work. Our educational institutions provide opportunities for free training in the professions such as law, engineering, accounting, bookkeeping and similar "white-collar" jobs. But the facilities of free educational institutions for training in handicrafts and trades are pitifully meager. This despite the fact that vocational education in our public schools has made slow but steady progress. The problem of providing facilities for educating unemployed youths of the country, whether viewed as highly trained mechanics for the peace-time needs of industry or the war-time needs of defense, are challenges to American education. Some localities are famed for their public vocational schools but far too many have inadequate facilities. Patriotic citizens these days will be giving the highest kind of public-spirited service if they will create and stimulate interest in vocational education in their communities. For the service will be to the national defense no less than to the stalwart young manhood of America. Skilled machinists win modern wars!

THE THREE MAJOR CLASSIFICATIONS OF THE coming ordnance production program were well defined by Brig. Gen. Earl McFarland, assistant to the Chief of Ordnance, who explained to the congressional committee the purposes for which expenditures will be made to provide critical items of equipment for the Army's Initial Protective Force. General McFarland said: "As preliminary to a discussion of this program, I should like to say that the Ordnance Department, in considering this program, has divided it into three classes.

"First, new types of equipment which have been developed in the past few years, and which we have on hand and in process of manufacture in comparatively small quantities; as, for example, the 37-mm. antiaircraft guns and fire control, the 37-mm. antitank guns, 8-inch railway guns and mounts, 105-mm. howitzers, 155-mm. guns, medium tanks, scout cars, 81-mm. mortars, and semiautomatic rifles.

"Second, equipment in storage, which, by overhauling and by the manufacture of spare parts sufficient to maintain them in serviceable condition in the early stages of mobilization will render this equipment fit for immediate use; such, for example, as machine guns, pistols, revolvers, artillery recoil mechanisms, and fire-control instruments.

"And third, other classes of matériel, built or on hand, which, by suitable modification, may be converted into modern efficient weapons; as, for example, 75-mm. guns, and the 155-mm. howitzers, which, by modification, can be made into high-speed weapons.

"As to ammunition, ammunition for the new types of weapons is provided for and also ammunition for the older and existing types in which a shortage exists. In addition to that, a large amount of other ammunition requires renovation in order to be placed in serviceable condition.

"All the foregoing items are special and technical and have no part in commercial manufacture. Normally, these articles are all manufactured in Government arsenals, but to provide this material within the life of the appropriation it will be necessary to call upon industry for a large percentage of the entire program."

COL. JAMES E. McNARY, WELL-KNOWN LEADER in industrial and military fields, is observing this year the fiftieth anniversary of his military service. He is a vice-president of the New York Post, Army Ordnance Association, and president of the Second Corps Area of the Reserve Officers' Association of the United States. After half a century, his activities are many and his zeal is undiminished. The occasion demands a well-deserved tribute to the man and his work.

Descendant of a line whose members have participated in every war in which our country has engaged, Colonel McNary is but following in the footsteps of his ancestors as he rounds out fifty years of service in the National Guard and the Organized Reserves. He enlisted in the Pennsylvania Guard in 1889, rose through grades to that of lieutenant colonel in 1905, when he served with one of Pennsylvania's historic regiments, the 18th Infantry (Duquesne Greys). He was assigned to the Inspector General's Department, Pennsylvania National Guard, from 1910 to 1917. Among the first to accept a commission in the Officers' Reserve Corps during the World War, Colonel McNary began his overseas service in September 1917. Thence he served as Chief Ordnance Officer, Advance Section, Line of Communications; Chief Ordnance Officer, Equipment and Procurement Division, Services of Supply. He had special assignments with headquarters, 1st Division; artillery headquarters, First Army; and headquarters, Third Army at Coblenz, Germany. He returned to the United States in July 1919.

While chief of the Equipment and Procurement Division in France, Colonel McNary was called upon to design numerous articles of emergency equipment for use by our troops. Among these was the Liberty helmet designed to furnish greater protection than the British helmet. Production of the Liberty helmet was started shortly before the Armistice.

Throughout all the years, Colonel McNary has been an unfailing supporter of the two great branches of preparedness, man power and munitions power. During his long career he has received many commendations from superiors. It was a matter of regret to the late General Hof, Chief of Ordnance, that, when Colonel McNary was transferred to the Auxiliary Reserve in 1932, having attained the retirement age, peace-time policies prevented the promotion he so richly deserved.

We cite the case of Col. Jim McNary as typical in kind, if not in degree, of the long service of many Ordnance Reserve officers. They are actively engaged in civilian life but never fail in their willingness to assist in all things military. Service decorations are inspiring in themselves, but most valued, we imagine, by the many whom Jim McNary typifies, are the regard and admiration of those associates who serve quietly and sincerely through the years.

HEMISPHERE DEFENSE—THE NAME BY WHICH the present version of the Monroe Doctrine seems to go—has many aspects. Our statesmen will have the job of seeing that it synchronizes with the efforts of all our neighbors to the north and south. Our prime interest in mentioning the subject in these columns is to emphasize the armament phases of the problem. It is a departure in our national policy, obviously, to suggest that the War and Navy Departments supply directly to the governments of our sister republics whatever equipment they may need in building up their defense organizations. Senator Pittman has introduced such a proposal in a resolution now pending before the Senate Foreign Relations Committee. It would authorize construction of naval vessels, arms and ammunition in shipyards and manufacturing plants in the United States for our American neighbors.

Brig. Gen. George C. Marshall, Assistant to the Chief of Staff, joined with spokesmen for the State Department and the Navy in approving the proposal. However, the Assistant Chief of Staff insisted that such legislation must also authorize the Secretary of War *to procure* as well as manufacture for the countries concerned. This point is of first importance and legislation which overlooks it will not only be seriously defective but quite dangerous. It is a well-known fact among well-informed students of our national defense that our government-owned shipyards and arsenals are capable of producing a very meager portion of our own war-time needs. Consequently the proposed arrangement with our sister republics would be of practical value to our Government arsenals only during periods of slack production. As usual, our private industry would have to bear the burden under normal conditions and therefore the proposed legislation, to be worth anything at all, must authorize the War and Navy Departments to procure.

Thus modified, the proposal has mutual advantages. In the final analysis such sales will depend upon price and price is a matter of competition in the markets of the world. General Marshall, in his testimony before Congress, touched upon two other important phases of this subject. He said: "Some comment has been made and questions have been asked regarding the matter of secrecy, referred to in section 2 of the resolution. It is essential that a government purchasing such war material be provided with the restricted, confidential or secret plans, specifications, or information pertaining to the munitions; otherwise that government would not be able to operate and maintain in a satisfactory manner the items purchased. The control of the matter of secrecy will still remain in the hands of the Secretary of War or Secretary of the Navy, since such transactions must be based on a contract preliminary to proceeding further in the matter. If there were objection on the ground of secrecy, such a contract would not be entered into.

"The question has been raised as to whether the Ordnance Department could fill such orders for munitions without interfering with the enlarged program for materials on which we are about to embark. I might answer that by stating that, if interference was anticipated, the necessary contracts would not be accomplished. Also, if the joint resolution is amended so as to authorize the Secretary of War to procure as well as manufacture, then it would be possible, in fact rather probable, that the handling of such orders would be to our advantage, as they would supplement in an important manner our projected educational orders in preparing industry to meet demands for war matériel.

"The provisions of the joint resolution relating to testing or proving such munitions and repairing such arms, meet practical necessities involved in the matter. The testing must be done by experts prior to delivery and acceptance, and such experts are not generally available in the countries concerned. The same reason applies to the matter of repairs. The facilities and technicians are not usually available in the republics concerned. Therefore, as a practical proposition, it will be necessary to have the matériel repaired by the manufacturer in this country."

Over and above these technical considerations is the matter of national policy as well as the application of international law. The Ordnance engineer, however, will see in the proposal the possibility of helping friendly neighbors and at the same time adding to hemisphere defense by educational orders of a very practical kind for private industry in the United States.

SOME PRETTY SOUND ADVICE ABOUT PROTECtion during air attack was given recently by a chemical-warfare expert. Lieut. Col. Haig Shekerjian, executive officer to the Chief of the Chemical Warfare Service of the Army, gave the advice when he addressed the Royal Canadian Institute at Toronto. Colonel Shekerjian did a little debunking and a little advising along these lines:

"The purpose of my talk this evening is to give you a certain degree of reassurance. No town or large group of people can possibly be 'blotted out' by any conceivable attack with gas. An attack with high explosive would cause much more destruction. If gas were used, there would be much confusion, disruption of ordinary business, a certain number of casualties, and a definite effect on the morale, but certainly there would not be general destruction of life and property.

"I realize that the problem of air attack on cities cannot be lightly passed by with the statement that the amount of possible damage is quite limited. Any nation that may be involved in war must take certain precautionary measures to further delimit the effectiveness of air attack. It must organize a warning system against air raids. Bombproof and gasproof shelters should be provided and gas masks should be available for the inhabitants of localities susceptible to gas attack. Fire departments should be prepared for the many fires that might be started by incendiary bombs.

"There must also be provided methods of active defense comprised of antiaircraft guns, defensive aircraft and such devices as balloon aprons. If effective, this group for active defense could break up the hostile attack completely and at least will disrupt the hostile attack, materially reducing its effectiveness.

"In addition, a first-aid organization should be provided, as well as degassing units and perhaps most important of all should be public instruction and organization, because much of the danger from air attack can be largely eliminated by cool and intelligent action during and following an attack. If gas were to be used on a community, the great danger presented would not be from the casualty effect of the gas, but rather by the panic which might be caused in the population at large. The danger of panic can be averted only by thorough instruction. All of the people should know what to expect and what to do."

The Life Line of Defense

An Editorial

LEADERS of American industry gathered in inspiring numbers on the eve of Army Day 1939 to signalize the vitality of industrial preparedness in these days of uncertain international relations. Twelve hundred representatives of industry assembled under the sponsorship of the nation-wide professional, trade and engineering societies to hear spokesmen for the Army and Navy assert the status of our industrial strength in its relation to our military and naval power at the moment. This sponsoring group, called The American Conference on National Defense, had as its chairman Gen. Samuel McRoberts, chief of the New York Ordnance District; as its vice-chairman, Col. Frederick H. Payne (who is chairman of the Army Ordnance Association's Committee of Three Hundred on Twentieth Anniversary), former Assistant Secretary of War, and as its secretary, Hartley W. Barclay, editor of *Mill and Factory*.

Thanks especially to these three gentlemen for their initiative, leadership and effort through many weeks, and to the leaders of industry, the dinner meeting of the Conference at the Waldorf-Astoria Hotel in New York City, was significant. It was impressively significant in that a spokesman for the Assistant Secretary of the Navy, Mr. Charles Edison, presented the Navy's appraisal of industrial preparedness. This capable spokesman was Rear Adm. Clark H. Woodward. The meeting was historically significant in that the guest of honor, Hon. Louis Johnson, the Assistant Secretary of War, speaking to these representatives of industry and to the entire American people through a nation-wide radio broadcast, placed upon industrial preparedness, as it has evolved during twenty-two years, the seal of national approval and accorded it the praise which only sincerity and disinterestedness merit. To industry he gave the shibboleth "our life line of defense."

TO sustain the point that industry's coöperation is traditional, Mr. Johnson cited some current facts. He told how industry but recently had come to the aid of government in the procurement of a reserve supply of strategic raw materials —so essential to an industrial-mobilization program. He cited the spirit of coöperation which underlies the National Defense Power Committee. He acknowledged the debt of the War Department to industry, the technical societies, the trade associations and coöperating committees, and finally he presented a special message from the President of the United States in these words: "In the revival of the spirit of national defense, industry is playing a leading and vital rôle. I am conscious of its loyalty. I appreciate its coöperative efforts. Its patriotic services I commend as an example of good and useful citizenship."

That the life line may be strengthened, the Assistant Secretary of War urged three immediate steps. The first is that industry support the national rearmament program until every phase of it is enacted into law. "This," the Secretary said, "is farsighted, patriotic and nonpartisan. It merits your whole-hearted support. It demands a Navy second to none. It calls for an Army, small in size, compact in organization, fully equipped with the best of modern arms and capable of expansion to meet any emergency." The second is that our people keep an open mind on our defensive needs, for national defense cannot be measured in absolute terms. "What was adequate yesterday, we know is no longer today. What may be enough to protect us when the President's program is realized, at some future day may prove wholly insufficient." The third is the function of self-education in the production of armament. On this score the Assistant Secretary said, "We trust that the War Department will be able to come to the assistance of those of you who are on the program to manufacture critical items for which there are no ordinary peace-time demands. At the suggestion of the President, both Houses of the Congress have authorized the appropriation of forty-two and a half million dollars for educational orders toward the preparation of industry for war-time tasks. When supported by appropriations, this measure will provide the War Department with the necessary means, over a period of years, to help educate those plants which have been allocated work on strictly non-commercial items."

Finally, the strength of the life line will depend on the fiber of which its strands are made. These strands consist of the information gathered by War Department procurement officers who visit individual plants. "They are men of extensive military experience, who are specializing in industrial mobilization. They have a record of achievement which merits your approval. They do not pose as industrialists. They do not come to tell you how to run your factories."

THERE must have been many at this historic meeting, whether among the 1200 physically present or the millions listening in, who saw in retrospect the steady growth of what was an idea twenty-two years ago into an accepted philosophy today. In such growth there would be nothing remarkable as the evolution of doctrines and the development of policies go. But a shaky world has brought about a peace-time consciousness of national defense such as the American people have not before experienced in their history. It is a defense consciousness not for war but for peace. This keynote was sounded by the toastmaster, Colonel Payne, when he said: "We meet on the eve of a great anniversary. With the dawn of tomorrow, twenty-two years will have passed since that momentous occasion when the American people, through their duly elected representatives, determined to gird for battle in defense of human life. We are met tonight on the eve of this anniversary for a two-fold purpose; first to renew before the country and the entire world our belief in our traditional American institutions, and secondly, to pledge our coöperation to the Army and Navy of the United States which are our sure guaranties of the permanency of those institutions. In the expression of this purpose we are honored by spokesmen for both Army and Navy. These are gentlemen who are in close touch with industry's place in national defense. They will verify the facts that the factories of America are part of our frontiers wherever they be, and that our engineers and manufacturers are shoulder to shoulder with the officers and men of the fighting forces. These are facts which were not understood this night twenty-two years ago. Thank God that tonight the messages we are to hear have their very being in the knowledge that our unpreparedness of 1917 has resulted in our preparedness of 1939."

Association Affairs

DIRECTORS' MEETING

THE annual meeting of the officers and directors of the Army Ordnance Association was held at the Metropolitan Club, New York City, February 16, 1939, at 2 o'clock in the afternoon following luncheon. In the absence of General Crowell of Cleveland, president, who was unavoidably detained, Col. William W. Coleman of Milwaukee, first vice-president of the Association, presided. By special invitation of the board, Maj. Gen. C. M. Wesson, Chief of Ordnance, was guest of honor at the luncheon. Officers and members of the board who were present were: Col. Frederick H. Payne, Greenfield, Mass., second vice-president; Brig. Gen. John Ross Delafield, New York, counsel; Brig. Gen. Charles Elliot Warren, New York, treasurer; the following directors: Brig. Gen. Samuel McRoberts, New York; Col. Frank A. Scott, Cleveland; Col. Robert P. Lamont, New York; Col. James L. Walsh, New York; and Lieut. Col. L. A. Codd, Washington, executive secretary. Lieut. Col. J. K. Clement, secretary, New York Post, was present at the luncheon by invitation of the board.

Colonel Coleman expressed the greetings of the board to General Wesson for his many kindnesses and courtesies to officers and directors individually and to the Association as a whole. The chairman announced the election to membership on the board of Edmund A. Russell, representing the Chicago Post. Mr. Russell was unable to attend the meeting but felicitations were extended to him for his service to the Army Ordnance Association and for his long distinguished record of achievement with the Chicago Ordnance District.

THE first business to come before the meeting was the report of the treasurer for the year 1938. The report was presented by General Warren who announced that the financial records of the organization as of December 31, 1938, had been audited by Messrs. Ernst & Ernst, certified public accountants. The treasurer's report was accepted with thanks and approved. Its principal tabulations were:

RECEIPTS AND EXPENDITURES

Receipts	*1938*	*1937*
Old members	$ 7,184.62	$ 7,026.39
Old group members	4,300.00	3,846.00
New members	2,262.05	1,303.92
New group members	400.00	300.00
Interest	1,100.13	1,205.05
Old subscribers	1,726.48	1,916.52
New subscribers	1,108.13	981.32
Advertising	6,027.90	4,651.80
Annual Meeting	0.00	423.50
Miscellaneous	279.48	223.99
Life members	0.00	100.00
	$24,388.79	$21,978.49

Expenditures	*1938*	*1937*
Rent	$ 1,110.00	$ 1,110.00
Office expense	1,172.05	1,046.22
Salaries	11,835.00	11,074.00
Postage	840.26	789.46
Annual Meeting	298.29	1,266.67
Office equipment	0.00	0.00
Extension	710.31	596.13
Post refunds	490.75	304.75
Contingencies	495.07	1,322.66
ARMY ORDNANCE	8,094.13	7,186.31
Taxes and insurance	0.00	154.64
	$25,045.86	$24,850.84

The balance sheet showed the following assets and liabilities:

Assets	*1938*	*1937*
Cash on hand	$ 544.80	$ 632.13
Cash on deposit	1,288.03	815.70
Accounts receivable:		
Due from advertisers	50.00	48.88
Other assets:		
Securities owned	24,051.25	23,892.81
Postage	174.25	100.61
Furniture and fixtures	1.00	1.00
Deferred charges		
Commission on prepaid advertising	144.90	144.90
	$26,254.23	$25,636.03

Liabilities	*1938*	*1937*
Unearned income:		
Prepaid membership dues	$ 6,558.55	$ 5,855.73
Prepaid subscriptions to magazine	987.00	983.25
Prepaid advertising	378.10	322.00
Reserves:		
Endowment fund	822.50	822.50
Life memberships	2,100.00	2,100.00
Operating reserve	15,408.08	15,552.55
	$26,254.23	$25,636.03

A minute was spread upon the records in which the board acknowledged its deep thanks to General Warren for his long and faithful service to the Association.

THE annual report of the executive secretary, presented by Lieut. Col. L. A. Codd, contained the following principal items: The total membership of the Association as of January 1, 1938, was 2734. During the year, 640 new members were enrolled while 309 old members were removed from the roster through resignation, death, and nonpayment of dues. The membership as of December 31, 1938 was 3065. There were 49 group members, 21 life members, and 656 subscribers for ARMY ORDNANCE.

During the year the Rochester Post was established with a membership of sixty-two. It was chartered by the president on April 29, 1938, at ceremonies held in Rochester. There are now fourteen chartered posts. The total number of members affiliated with local posts is 1880, or 61.3 per cent of the total Association membership. During the year, the policy was adopted of automatically assigning new members to membership in the post in whose territory the member resides.

The report recommended approval of a budget based upon expected income for the year 1939 of $31,000 and authorized expenditures for the year of $30,500.

The report concluded with the following paragraphs:

"The Nineteenth Annual Meeting of the Association was held at the Rock Island Arsenal on May 25, 1938, by invitation of the Chief of Ordnance, Maj. Gen. William H. Tschappat. A most interesting program of demonstrations, exhibits and inspection was arranged by the commanding officer, Col. N. F. Ramsey. This was the first of our annual meetings to be held in the Middle West and judged by the huge attendance was eminently successful in acquainting the citizens of that area with ordnance preparedness.

"At a dinner held that evening, the principal speaker was the Assistant Secretary of War, Hon. Louis Johnson. More than 700 guests were assembled for the dinner. Special trains were operated from Chicago, Milwaukee, and St. Louis and special cars from New York, Philadelphia and Pittsburgh.

"I take the liberty of spreading upon the pages of this report the deep thanks of the officers and members of the Association to the following who assisted so generously in the conduct of this meeting: General Tschappat and his assistant officers in the Office of the Chief of Ordnance; Colonel Ramsey and his military and civilian assistants at the arsenal; Lieut. Col. J. K. Clement, New York; Lieut. Col. A. B. Johnson, Chicago; Maj. Walter C. Hamilton, Philadelphia; Maj. Hugh C. Minton, Pittsburgh; Maj. H. M. Reedall, St. Louis; and Maj. Roger

Sherman Hoar, Ord. Res., Milwaukee. Each of these gentlemen and countless other members are largely responsible for the unusual success of this gathering.

"In accordance with the constitution of the Association, the biennial election of officers was held on September 6, 1938. The nominating committee appointed by the president consisted of the following members: H. A. Gidney, chairman; W. W. Tangeman, Earl B. Gilmore, Lieut. Col. Henry P. Erwin, and Lieut. Col. C. S. Robinson. The tellers of election were: Capt. C. Wingate Reed, chairman; Arthur Adelman, and Maj. T. R. Snyder. Letter ballots from the entire membership were canvassed at the headquarters offices of the Association with the practically unanimous reëlection of the following, to serve from January 1, 1939: For president, Brig. Gen. Benedict Crowell; for vice-presidents, Col. Wm. W. Coleman and Col. Frederick H. Payne; for directors, Maj. Gen. C. C. Williams, Brig. Gen. Samuel McRoberts and Lieut. Col. LeRoy Hodges.

"As will be noted from the above, especially the budget of income and expenditures for 1939, I believe that this year is of exceptional meaning to the industrial-preparedness movement. World events, together with our own armament program, are focusing attention on ordnance preparedness as it has not been focused since this Association was established nearly twenty years ago. It would seem that unless the Association grows during this period its future will be decidedly limited and indeed the movement may eventually dwindle away entirely. Hence it is proposed that an extensive program be embarked upon commensurate with popular interest. This program is reflected above. I trust that this view will meet with the approval of trustees and directors.

"Pursuant to the directive of trustees and directors last year, a nation-wide Committee of Three Hundred on Twentieth Anniversary has been organized under the chairmanship of our second vice-president, Colonel Payne. The committee is divided into fifteen sections and is functioning actively.

"In closing, I desire to again express my personal thanks to all officers and directors for their unfailing graciousness and assistance in all Association matters. Likewise it is proper to record the coöperation rendered by officials of the War Department on countless occasions. I refer first to the Assistant Secretary of War, Mr. Johnson, and the personnel of his office. It is essentially a part of this record always to cite with thanks the coöperation and helpful interest of the Chief of Ordnance and his assistants both in Washington and in the field. This tradition, so generously carried on by General Tschappat as Chief of Ordnance until his retirement from office May 31st, is renewed and strengthened by his successor, our present zealous Chief of Ordnance, General Wesson. Whatever the Army Ordnance Association represents as a contribution to the national defense of our country through industrial preparedness is, in a special way, the aggregate effect of the interest, support, and loyalty of all these gentlemen in the public service and in private life. For my part it is a happy and valued experience to be associated with them."

THE chairman called for reports from committees. Colonel Payne, chairman of the Committee of Three Hundred on Twentieth Anniversary, reported that his committee was organized on a nation-wide basis and had begun its activities. The committee is taking steps to increase the membership of the Association and also to observe the twentieth anniversary of its founding.

General McRoberts, chairman of the American Conference on National Defense—a temporary body consisting of engineering, patriotic, and industrial organizations—reported that the Conference had been formed to sponsor an industrial-preparedness dinner in New York City on the evening of April 5th at which Hon. Louis Johnson, the Assistant Secretary of War, would be the principal speaker.

It was regularly moved and seconded that the annual meeting of the Association marking its twentieth birthday be held, if the Chief of Ordnance approves, at the Aberdeen Proving Ground during October 1939.

The chairman then called upon General Wesson. The General expressed his gratification to the officers and members of the Army Ordnance Association for their coöperation in furthering the interests of the Ordnance Department and of the Army. He expressed his admiration for the work the Army Ordnance Association has done and hoped that it might continue to assist him as it had his predecessors since the World War. A vote of thanks was unanimously tendered General Wesson both for his attendance at this meeting and for his remarks.

The chairman suggested a vote of thanks also to General Warren who made available the facilities of the Metropolitan Club where this meeting was held and who arranged the luncheon which preceded the meeting. The motion was unanimously adopted. Whereupon the meeting was adjourned.

ST. LOUIS POST

AN INDUSTRIAL national-defense dinner under the auspices of the St. Louis Procurement District was a noteworthy occasion in the annals of ordnance preparedness in that area. The dinner was held at the Coronado Hotel, St. Louis, on the evening of March 9th. Col. Harry Scullin, chief of the St. Louis Ordnance District, Willard Cox, assistant chief, Col. Edwin B. Meissner, president of the St. Louis Post, Army Ordnance Association, and Maj. H. M. Reedall, executive officer of the district, led the various groups which acted as cosponsors. These were the Army Ordnance Association, St. Louis Chamber of Commerce, Engineers Club of St. Louis, and local sections of the following national organizations: American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Society of Tool Engineers, and Society of Automotive Engineers. Four hundred and seventy-five members and guests assembled for the dinner and the addresses which followed.

The principal address of the evening was delivered by Maj. Gen. C. M. Wesson, Chief of Ordnance of the Army. General Wesson responded to the toast "Ordnance Preparedness is National Prepardeness." In a masterful address, he drew upon our military and industrial experience during the World War to show the present need for war reserves of modern ordnance equipment for our Army and also the necessity of adequate armament research. He spoke of the requirements of fighting equipment for our Regular Army and National Guard—an initial protective force of 400,000 men—and explained that the item of $110,000,000 which appears in the program recently sent to Congress by the President is intended partially to remedy shortages for this force.

General Wesson stressed the value of the military airplane as an auxiliary weapon. He said that being essentially an offensive weapon it can take but cannot hold. It must operate from bases held and protected by other troops. Barcelona fell only when it came within the range of Franco's artillery. The history of war, the General emphasized, demonstrates that victory has never been complete until the critical objectives were in the possession of the infantry soldier to whom all other arms of the service—artillery, tanks, cavalry, as well as aircraft—are auxiliary.

Finally he described the Ordnance District system and its dependence upon personnel. He congratulated Colonel Scullin and Mr. Cox. He praised and thanked the executives and directing heads of the great industries of St. Louis who are coöperating in ordnance preparedness. He expressed the grati-

INDUSTRIAL NATIONAL DEFENSE DINNER, CORONADO HOTEL, ST. LOUIS, MO., MARCH 9, 1939

tude of the Department to its Reserve officer personnel and in conclusion he spoke of the Army Ordnance Association.

"The Army Ordnance Association," General Wesson said, "is a common meeting ground for the four elements of personnel essential to ordnance preparedness. The Association is composed of American citizens pledged to industrial preparedness for war as our nation's strongest guaranty of peace. It was organized shortly after the World War by a distinguished group of public-spirited citizens. For almost twenty years it has fought tenaciously and continuously for adequate industrial preparedness. It has ever supported the Ordnance Department in its efforts toward this end. Today, after many years of unremitting effort, years filled with disappointments, the Association can stand four-square before the country and proudly say 'our principles are vindicated. Our labors have not been in vain.'"

Preceding General Wesson's speech, short addresses were given by Colonel Scullin, who presided at the meeting; Hon. Bernard F. Dickmann, Mayor of St. Louis; Brig. Gen. C. T. Harris, Jr., Assistant to the Chief of Ordnance and Chief of the Industrial Service; Colonel Meissner and Lieut. Col. L. A. Codd, executive secretary of the Army Ordnance Association. John C. Hall, president of the St. Louis Federal Savings and Loan Company, was toastmaster. His humor and facility of expression were a most enjoyable part of the program. The vast assembly rose and applauded Major Reedall, the popular secretary of the St. Louis Post, who was immediately in charge of the banquet and for the organization of which he was principally responsible.

Seated at the speakers' table, in addition to those previously mentioned, were the following: Thomas N. Dysart, president, St. Louis Chamber of Commerce; Col. Fred W. Green, vice-president, St. Louis Southwestern Railroad; Hord Hardin, vice-president, Mississippi Valley Trust Company; Henry W. Kiel, trustee, St. Louis Public Service Company; Newell H. Orr, Colorado Fuel & Iron Company, Denver, Colo.; Lieut. Col. A. B. Johnson, executive officer, Chicago Ordnance District; George Throop, chancellor, Washington University, St. Louis; Hugh H. C. Weed, vice-president and general manager, Carter Carburetor Corporation; Col. C. H. Muller, U.S.A.; C. E. Allen, Westinghouse Electric and Manufacturing Company; Girard C. Varnum, president, St. Louis County Chamber of Commerce; W. L. Hemingway, president, Mercantile-Commerce Bank & Trust Company; Lieut. Col. R. K. Stacey, U.S.A.; Col. F. C. Jonah, St. Louis—San Francisco Railroad; F. W. Olin, president, Western Cartridge Company; E. W. Davis, Westinghouse Air Brake Company; Walter W. Head, president, General American Life Insurance Company; J. B. Strauch, president, National Bearing Metals Corporation; Col. Harry B. Crea, commanding officer, Jefferson Barracks; Col. Francis M. Curlee; T. R. Akin, president, Laclede Steel Company; Thomas H. Wright, vice-president, National Bearing Metals Corporation; Col. L. C. Kingsland, Missouri National Guard; G. A. Waters, chief engineer, Wagner Electric Corporation.

LOS ANGELES POST

THE Los Angeles Post of the Army Ordnance Association has held two mammoth meetings since the first of the year. The annual meeting was held at the Los Angeles Athletic Club on the evening of February 8th when 328 members and guests attended the dinner and meeting to hear Maj. Gen. Henry H. Arnold, Chief of Air Corps of the Army, who was the principal speaker. The second meeting was the gala meeting at March Field on Sunday, March 19th, for an exhibition of Air Corps equipment. According to the *Los Angeles Examiner* nearly 35,000 men, women and children attended this exhibition.

To take the annual meeting first, Earl B. Gilmore, president of the Post, presided at this function and introduced General Arnold whose address was broadcast over a National Broadcasting Company hook-up. His address was published in full in the last issue of ARMY ORDNANCE (March-April 1939, Vol. XIX, No. 113, p. 267). Short addresses also were given by Dr. Robert A. Millikan, California Institute of Technology, Elmer H. Howlett, president, Los Angeles Merchants and Manufacturers Association, and Gene Biscailuz, sheriff of Los Angeles County. The chairman also introduced Col. E. A. Stockton, newly appointed commanding officer at Fort MacArthur, and Maj. A. R. Baird, Ord. Dept., newly assigned to Ordnance activities at Los Angeles.

Telegrams of greeting were read from the Assistant Secretary of War, Louis Johnson; the Chief of Ordnance, General Wesson, and the executive officers of the Army Ordnance Association.

Seated at the speakers' table, in addition to those already mentioned, were: James L. Beebe, president, Los Angeles

Official Photograph, U. S. Army Air Corps

PART OF THE CROWD VIEWING AIR CORPS EQUIPMENT DURING ORDNANCE DAY, MARCH FIELD, CALIF., MARCH 19, 1939

Chamber of Commerce; Donald Douglas, president, Douglas Aircraft Company; Col. Carlyle H. Wash, commanding officer, March Field; Brig. Gen. Delos C. Emmons, commanding the GHQ Air Force; Maj. Thomas Jervey, Ordnance Department, March Field; Maj. H. P. Detweiler, executive officer, Fort MacArthur; Maj. Victor F. Bleasdale, Marine Corps; Capt. C. B. Mayo, Naval Reserve; Paul Shoup, president, Southern Californians, Inc.; Dr. Frank Barham, *Los Angeles Herald & Express;* Col. H. E. Yates; Mr. Crocker, *Los Angeles Examiner.*

FOR an account of Ordnance Day at March Field on March 19th, we quote the following from the *Los Angeles Examiner:*

"Riverside, March 19.—Nearly 35,000 men, women and children converged on March Field today to witness one of the most interesting displays of United States air power ever held in Southern California.

"It was an all-day affair, with visitors pouring through closely guarded gates throughout the morning; being questioned by sentries regarding their citizenship and whether they had photographic equipment with them. It was sponsored by the Los Angeles Chapter, Army Ordnance Association.

"Along paved ramps edging the vast flying field were the latest types of Army fighting craft from tiny, swift pursuit planes to giant flying fortresses recently flown here from Langley Field, Va. Special ramps were built over wings to afford full view of the interior of the fortresses to spectators. There was hardly an exhibit that failed to draw enthusiastic interest. Bombs galore, from 25-pound 'fragmentary parachute' bombs to huge 'feathered' missiles weighing more than a ton, were in an exhibit space that proved extremely popular.

"Music by the 63rd Coast Artillery band wooed its share of sightseers to the display of its 'outfit' which included a review of the latest in antiaircraft guns, searchlights, and plane-detection equipment.

"Thrilling, indeed, was the simulated 'gas attack' staged by a flock of speedy pursuit planes, dropping a quick-spreading water screen over adjacent fields in lieu of deadly poisons.

"Dignitaries were greeted by public relations officer J. A. Jensen, who was official host. Earl Gilmore, president of the Los Angeles Chapter, Army Ordnance Association, was among several speakers."

In a colorful ceremony held in conjunction with the Ordnance Day program, the regimental colors of the 363rd Infantary, of Los Angeles, were decorated with three battle streamers awarded the regiment for participation in the Lorraine, Meuse-Argonne, and Ypres Lys offensives of the World War. The regiment had present in formation 145 Reserve officers of the current regimental roster, organized into a provisional battalion of three companies, with a band furnished by the 63rd Coast Artillery (AA) from Fort MacArthur, Calif.

Maj. Gen. Ewing E. Booth, U.S. Army, Retired, attached the battle streamers to the regimental colors, then received the review. Included on his staff were Mr. Gilmore and 16 former members of the 363rd Infantry who served in that regiment during the World War.

The program continued from 10 A.M. to 3 P.M. Luncheon from Army field kitchens was served to 2432 persons. At a meeting incident to this demonstration, addresses were made by Col. H. E. Yates, executive officer of the First Reserve District, Lieut. Col. C. B. Oldfield, Air Corps, and Maj. Thomas M. Jervey, Ord. Dept. At a subsequent general meeting at which Maj. Ralph Cook Scott, secretary of the Los Angeles Post, presided, addresses of welcome were made by Col. R. B. Lincoln, commanding officer of March Field, and Mr. Gilmore. Mr. Gilmore thanked the commanding officer and all other officers at March Field who had worked so hard to make the day one of the most successful military demonstrations in the history of the Pacific coast.

AMERICAN CONFERENCE ON NATIONAL DEFENSE

UNQUESTIONABLY the largest and most significant meeting devoted to industrial preparedness in recent years was held in New York at the Waldorf-Astoria Hotel on the evening of April 5th when, under the sponsorship of the American Conference on National Defense, leaders of industry and the professions assembled for a consideration of current preparedness problems. The principal speakers were Hon. Louis Johnson, the Assistant Secretary of War and Rear Adm. Clark H. Woodward, U. S. Navy. More than 1200 guests were assembled for dinner.

Brig. Gen. Samuel McRoberts, chief of the New York Ordnance District and a director of the Army Ordnance Association, was chairman of the Conference. Col. Frederick H. Payne, a

vice-president of the Army Ordnance Association, was vice-chairman of the Conference and toastmaster at the banquet. Hartley W. Barclay, a life member of the Army Ordnance Association and editor of *Mill and Factory*, was secretary of the Conference. Mr. Barclay did yeoman service in originating and arranging the banquet.

The following societies were members of the American Conference on National Defense: Army Ordnance Association, Society of American Military Engineers, Quatermaster Association, Reserve Officers Association, Association of Military Surgeons of the U.S.A., American Society of Mechanical Engineers, Society of Automotive Engineers, American Chemical Society, American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Institute of Electrical Engineers, and American Engineering Council.

BOSTON POST

AT THE regular meeting of the Boston Post, Army Ordnance Association, held on the evening of February 21, 1939, at Walker Memorial, Massachusetts Institute of Technology, Cambridge, Mass., the principal speaker was Frederick S. Blackall, Jr. He is president and treasurer of the Taft-Peirce Manufacturing Company, Woonsocket, R. I., and a member of the advisory board of the Boston Ordnance District.

Mr. Blackall presented a timely discussion of industry from the standpoint of the manufacturer's relation with the Government. There was a large representation of members and guests consisting not only of Regular Army and Reserve officers but many leaders in the industrial life of Boston.

BUFFALO PREPAREDNESS MEETING

THE industries of Western New York State participated in a mammoth dinner meeting devoted to industrial preparedness at the Hotel Statler, Buffalo, on the evening of Thursday, March 30th. Maj. Gen. C. M. Wesson, Chief of Ordnance of the Army, was the guest of honor and principal speaker. Col. William Kelly, president of the Buffalo Niagara & Eastern Power Company, was chairman of the committee. General Wesson's address appears in full on page 329 of this issue.

The meeting was arranged at the suggestion of the Western New York area of the Army Ordnance Association to give industrial leaders, manufacturers, engineers, and business executives an opportunity to learn in detail the problems confronting the production of ordnance equipment in time of emergency. How business and industry can best serve now and in emergencies, what problems must be faced, how the Army expects production to be handled—these were the problems emphasized.

Nearly seven hundred representatives of the industries of Buffalo and the engineering professions were seated in the Statler ballroom for dinner. The speakers, in addition to General Wesson, were Edwin J. Schwanhausser, manager, Worthington Pump & Machinery Corporation, toastmaster; Col. Ledyard Cogswell, Jr., chief of the upstate New York Army Ordnance district; Lieut. Col. A. B. Quinton, Jr., Ord. Dept., and Lieut. Col. L. A. Codd, managing editor, ARMY ORDNANCE. The sponsoring societies were the Army Ordnance Association, the Buffalo Chamber of Commerce, and the combined local chapters of engineering societies, including the American Institute of Electrical Engineers, American Society of Civil Engineers, American Society of Mechanical Engineers, Engineering Foundation of Buffalo, Engineering Society of Buffalo, New York State Society of Professional Engineers, and the Society of Automotive Engineers.

The dinner committee, in addition to its chairman, Colonel Kelly, consisted of Lawrence D. Bell, president, Bell Aircraft Company; Richard T. Cann, plant manager, E. I. du Pont de Nemours & Co.; Edward F. Entwistle, general manager, Bethlehem Steel Company; A. G. Gulliver, plant manager, Chevrolet Motor Company; A. G. Kessler, vice-president, Farrel-Birmingham Company; William L. Marcy, Jr., attorney; Karr Parker, president, McCarthy Brothers & Ford; Merrill E. Skinner, vice-president, Buffalo Niagara & Eastern Power Corp.; David W. Sowers, president, Sowers Manufacturing Company; Burdette S. Wright, vice-president and general manager, Curtiss Aëroplane Division, Curtiss-Wright Corporation; and Maj. Roy L. Bowlin, Ordnance District executive officer.

Preceding the meeting, General Wesson and his party, with members of the committee, inspected various industrial facilities in the Buffalo area. The plants visited included Chevrolet Motor and Axle Division, General Motors Corporation; Farrel-Birmingham Company; Curtiss Aëroplane Division of Curtiss-Wright Corporation, and the strip mill at Lackawanna Works of the Bethlehem Steel Corporation.

Luncheon was served at the Buffalo Club. Preceding the dinner-meeting, visitors, members of the committee, and presidents of the sponsoring societies were presented to General Wesson at an informal reception.

NEW MEMBERS

DURING the period February 1, to March 31, 1939, inclusive, the following applicants were admitted to membership in the Army Ordnance Association: George W. Alcock, Hempstead, N. Y.; J. W. Anderson, Kansas City, Mo.; A. D. Armitage, Buffalo, N. Y.; C. U. Arnold, St. Louis, Mo.; E. Augustine, St. Louis, Mo.

Edward C. Bailey, Greenfield, Mass.; Harding F. Bakewell, Los Angeles, Calif.; Louis Battey, Greenfield, Mass.; William H. Beardslee, El Segundo, Calif.; Joseph C. Betz, Cincinnati, Ohio; C. A. Binder, St. Louis, Mo.; C. E. Bleikamp, St. Louis, Mo.; R. George C. Boa, Lake Zurich, Ill.; L. Boddy, Ann Arbor, Mich.; G. T. Born, St. Louis, Mo.; Alexander Bradley, Jr., Pittsburgh, Pa.; E. L. Bradley, Waterbury, Conn.; Thomas H. Bradley, Los Angeles, Calif.; T. H. Branch, St. Louis, Mo.; Marvin J. Bray, Chicopee Falls, Mass.; Adam E. Bridge, Franklin, Ohio; E. Sherrill Brown, Boone, Iowa; Lloyd D. Brown, Inglewood, Calif.; Elmer J. Bryant, Greenfield, Mass.; Allen K. Bucknell, Boston, Mass.; Jesse B. Burton, Waterbury, Conn.

Harold D. Caldwell, Blacksburg, Va.; Theodore H. Caldwell, Midland, Mich.; Thomas P. Callahan, Wolburn, Mass.; Thomas P. Callahan, Richmond Heights, Mo.; Charles D. Campbell, Schofield Barracks, T. H.; Clarence P. Campbell, Santa Monica, Calif.; Zenas P. Candee, Watertown, Conn.; Paul E. Cardell, Detroit, Mich.; G. W. Carlson, Cleveland, Ohio; G. Walter Carpenter, Greenfield, Mass.; Henry Chamberlain, Beverly Hills, Calif.; W. E. Chamberlain, New Haven, Conn.; Calbraith P. Champlin, Buffalo, N. Y.; George P. Chapin, Springfield, Mass.; Anthony J. Chenot, Pittsburgh, Pa.; Ralph O. Chick, Glendale, Calif.; Donald G. Clark, Pittsburgh, Pa.; R. L. Coe, Waterbury, Conn.; C. H. Coles, Hartford, Conn.; W. G. Cowell, Ann Arbor, Mich.; C. R. Cox, Beaver, Pa.; D. K. Crampton, Waterbury, Conn.; John H. Crankshaw, Cambridge, Mass.; C. R. Crawford, Middletown, Ohio; William W. Crawford, Chicago, Ill.

R. H. Daisley, Detroit, Mich.; Dominic Decker, Brooklyn, N. Y.; Louis Denegre, New Haven, Conn.; John Denison, Detroit, Mich.; William H. Dennison, Detroit, Mich.; Daniel Dewey, Cleveland, Ohio; Donald E. Dickey, Kirkwood, Mo.; Robert E. Dillon, Buffalo, N. Y.; S. W. Dimick, Hartford,

Conn.; J. W. Dolan, St. Louis, Mo.; J. L. Dostal, Detroit, Mich.; John M. Duggan, Brooklyn, N. Y.; Russell M. Easton, Cincinnati, Ohio; I. F. Eckland, Peoria, Ill.; R. D. Ely, Waterbury, Conn.; P. H. English, New Haven, Conn.; M. K. Epstein, Springfield, Mass.; E. Evans, Detroit, Mich.

H. D. Fairweather, Hartford, Conn.; George W. Falk, Leominster, Mass.; George J. Faneuf, Nashua, N. H.; J. S. Fanning, Atlanta, Ga.; Arthur D. Fargher, West Los Angeles, Calif.; C. L. Farrand, New York, N. Y.; M. J. Farrell, Albany, N. Y.; Theodore C. Fedders, Buffalo, N. Y.; Henry J. Fiege, Waterbury, Conn.; Harold W. Finch, Wollaston, Mass.; W. A. Fitzgerald, St. Louis, Mo.; F. W. Flake, Hollywood, Calif.; E. R. Frost, Tiffin, Ohio; S. W. Fugett, West Middletown, Ohio; Jesse Gannon, Culver City, Calif.; Charles M. Ganson, Weston, Mass.; Allen H. Gardner, Eggertsville, N. Y.; R. L. Gay, Kansas City, Mo.; Robert W. Gerhart, Los Angeles, Calif.; A. G. Gibson, Middletown, Ohio; Huntly H. Gilbert, Chicago, Ill.; A. E. Glick, St. Louis, Mo.; L. T. Goodrich, Hartford, Conn.; Ralph F. Gow, Worcester, Mass.; George Edw. Grafton, Wellsville, Ohio; Nelson M. Graves, Buffalo, N. Y.; Clarence M. Gregg, Los Angeles, Calif.; Robert G. Guthrie, Chicago, Ill.

Stephen W. Hallaway, Waterbury, Conn.; C. H. Hamilton, Hartford, Conn.; J. A. Hamm, Middletown, Ohio; H. K. Hammerstein, St. Louis, Mo.; C. E. Hart, Waterbury, Conn.; O. W. Hein, Middletown, Ohio; Donald G. Henderson, Whittier, Calif.; E. P. Herrick, Hartford, Conn.; Albert Hetzel, Los Angeles, Calif.; Earl L. Heverly, Chicago, Ill.; H. H. Hilliard, Hartford, Conn.; Jackson J. Holtz, Dorchester, Mass.; Stanley X. Housen, Boston, Mass.; Thomas Clark Howard, New York, N. Y.; W. C. Husted, Waterbury, Conn.; Francis L. Hutsler, Los Angeles, Calif.; Allan Hyer, Hamilton, Ohio.

George Ironside, Hartford, Conn.; F. A. Jackle, Waterbury, Conn.; George E. Johnson, San Marino, Calif.; Melvin M. Johnson, Sr., Boston, Mass.; M. G. Josephson, Saugus, Mass.; Joseph Joy, New York, N. Y.; M. A. Joy, Cleveland, Ohio; Franklin Judge, Greenfield, Mass.

W. A. Kamman, St. Louis, Mo.; Boyd E. Keifer, Cincinnati, Ohio; H. Clayton Kendall, Worcester, Mass.; W. R. Kern, New York, N. Y.; Harold Kline, Chicago, Ill.; Oscar E. Koehler, Greenfield, Mass.; M. R. Koerner, West Hartford, Conn.; Earl R. Koonz, Greenfield, Mass.; Willard C. Kress, Kenmore, N. Y.; W. F. Kurfess, Hinsdale, Ill.; H. L. Kutter, Hamilton, Ohio.

Charles A. Lajotte, Los Angeles, Calif.; L. Lamoureux, Detroit, Mich.; J. Fred Langbein, Hamden, Conn.; Alfred La Pierre, Detroit, Mich.; Archibald R. LeMieux, Worcester, Mass.; Harry Lidstone, W. Hartford, Conn.; Lester W. Light, Luke Field, T. H.; Edwin C. Ludwig, St. Louis, Mo.; Henry B. Lytle, Franklin, Ohio; George H. Marston, Colorado Springs, Colo.; H. D. Martindale, Middletown, Ohio; C. H. McCollam, Canton, Ohio; Walter P. McCulla, Cherokee, Iowa; H. J. McGinn, Cleveland, Ohio; Edwin B. Meissner, Jr., Philadelphia, Pa.; John Robert Mertens, Kenmore, N. Y.; L. L. Middleton, Kansas City, Mo.; M. J. Morell, Detroit, Mich.; Albert A. Morey, Chicago, Ill.

Victor C. Nelson, Boston, Mass.; Fred Newmann, New Haven, Conn.; Homer W. Nims, Cromwell, Conn.; Anthony L. Nugey, Rahway, N. J.; C. I. Ochs, Cleveland, Ohio; W. R. Odor, Lynchburg, Va.; Joseph Onufrachuk, Honolulu, T. H.

William C. Panzer, Chicago, Ill.; James B. Parrott, Atlanta, Ga.; Morris B. Payne, New London, Conn.; Russell H. Pedigo, Greenville, Miss.; Marsdon O'Dell Penrose, Chicago, Ill.; Richard S. Perkin, New York, N. Y.; S. H. Perry, Waterbury, Conn.; Lionel A. Petrov, Cincinnati, Ohio; James A. Phillips, Jr., Pasadena, Calif.; Thomas R. Phillips, Fort Leavenworth, Kans.; Clark A. Pickering, Middletown, Conn.; William D. Pierson, Waterbury, Conn.; J. F. Plumb, Cedar Rapids, Iowa; Edward S. Pomeroy, Springfield, Mass.; Brooks Potter, Boston, Mass.; James A. Pratt, Loch Raven, Md.; George W. Pressell, Philadelphia, Pa.; De Sonne D. Purrington, Oakland, Calif.

Paul M. Raigorodsky, Kerrville, Tex.; Allen Ramey, Kansas City, Mo.; George R. Ray, Chicago, Ill.; N. L. Rehnquist, St. Louis, Mo.; Fred H. Rhodes, Jr., Seattle, Wash.; Edward E. Rice, Boston, Mass.; Harry D. Rindsberg, Cincinnati, Ohio; Alden G. Roach, Pasadena, Calif.; Benjamin F. Rogers, Kingston, Pa.; Franklin M. Roshon, Phoenixville, Pa.; S. P. Ross, Philadelphia, Pa.; H. F. Roush, Lima, Ohio; Alfred J. Rubyor, Pearl River, N. Y.

Edward B. Sandelands, Galveston, Tex.; Sidney S. Sapper, Portsmouth, Ohio; Carl Schildback, West Haven, Conn.; H. W. Schmidt, Chicago, Ill.; Henry R. Schultheis, Los Angeles, Calif.; Anton J. Schwister, New York, N. Y.; W. J. Secor, Waterbury, Conn.; H. R. Sheldon, Pueblo, Colo.; J. C. Shepherd, Kansas City, Mo.; C. F. Sherman, Hartford, Conn.; J. J. Sieber, Chicago, Ill.; F. K. Simmons, Hartford, Conn.; John Slezak, Sycamore, Ill.; Don P. Smith, Los Angeles, Calif.; Frank W. Smith, Waterbury, Conn.; Herbert J. Smith, Greenfield, Mass.; W. L. Smith, Cleveland, Ohio; William Tait Snedden, Los Angeles, Calif.; Julius Sommers, Hamden, Conn.; George A. Spencer, Chicago, Ill.; Earl T. Stephens, Los Angeles, Calif.; H. A. Stevens, Hartford, Conn.; T. R. Strobridge, La Grange, Ill.; H. Spencer Struble, Buffalo, N. Y.; J. Sullivan, West Haven, Conn.; J. A. Sullivan, St. Louis, Mo.; Ward W. Swarthout, Detroit, Mich.; Steven G. Sweet, Rye, N. Y.

Roy M. Taylor, Plainfield, N. J.; James D. Tewel, Cincinnati, Ohio; John F. Tholl, Needham, Mass.; C. B. Tibbetts, Los Angeles, Calif.; John F. Tinsley, Worcester, Mass.; Vernon L. Tipka, Portland, Oreg.; Irving H. Tolles, Waterbury, Conn.; Raymond P. Townsend, Hartsdale, N. Y.; Nathan Tufts, Greenfield, Mass.

Harold Vagtborg, Chicago, Ill.; William E. Van Horn, Buffalo, N. Y.; T. Verhoef, Seattle, Wash.; Robert E. Vick, Raleigh, N. C.; Edward H. Vockrodt, Los Angeles, Calif.; F. W. Von Wehrden, St. Louis, Mo.

W. H. Wallace, Detroit, Mich.; D. T. Warner, Ann Arbor, Mich.; George Webb, Hartford, Conn.; John H. Weiser, Beverly Hills, Calif.; Frank H. Wesson, Springfield, Mass.; Harold Wesson, Longmeadow, Mass.; V. H. Wesson, Longmeadow, Mass.; William C. Westbrook, East Hartford, Conn.; F. A. Westphal, Kansas City, Mo.; W. E. Whipp, Sidney, Ohio; J. Clark White, Inglewood, Calif.; John F. Whitehead, Guilford, Conn.; R. H. Whitehead, New Haven, Conn.; Floyd E. Whittenburg, Culver City, Calif.; R. L. Wilcox, Waterbury, Conn.; Jarvis Williams, 3rd, Los Angeles, Calif.; Keith Williams, Buffalo, N. Y.; Mark J. Woodhull, Santa Monica, Calif.; E. C. Wrausmann, St. Louis, Mo.; R. S. Wright, San Francisco, Calif.; V. C. Young, Detroit, Mich.; Allen H. Zane, Jr., Bethlehem, Pa.; Clarence C. Ziegler, Chicago, Ill., and Victor H. Zimmermann, Pittsburgh, Pa.

NECROLOGY

ADM. RALPH H. EARLE, president of Worcester Polytechnic Institute since 1925 and distinguished chief of the Bureau of Ordnance of the Navy Department throughout the World War, died suddenly while addressing students of the Institute at chapel exercises February 13, 1939.

Born in Worcester, he entered the U. S. Naval Academy from which he was graduated in 1896. His naval experience was extensive. In 1898 he was navigator and watch officer of the U.S.S. HORNET, participating in the battles of Manzanillo.

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In 1912 he served on a special board on naval ordnance and in 1916, after a tenure as commandant of the Naval Proving Ground, he was made Chief of the Bureau of Ordnance, Navy Department, a responsibility he held until 1919. Subsequently he commanded the Naval Torpedo Station at Newport, R. I. In 1925 he became president of Worcester Polytechnic Institute.

A gentleman of quiet manner and deep knowledge, Admiral Earle was closely associated with an historic period of ordnance development. Early in our participation in the World War he was responsible for the development of plans and the provision of matériel for the North Sea mine field.

In his passing, the Ordnance fraternity loses one of its distinguished war-time leaders, American education a forceful influence, and many of our members a dear friend.

LIEUT. COL. HUGO DIEMER, director of management training, LaSalle Extension University since 1920, died suddenly, Friday, March 3rd, at the age of 69. He was prominent as an engineer, educator, and author. Colonel Diemer taught at Michigan State College, the University of Kansas, and Pennsylvania State College.

A major in the Ordnance Department during the World War, he served at the United States Cartridge Company, Lowell, Mass., in 1917, and at Bethlehem Steel Company, 1918. In 1919-1920 he was personnel superintendent of the Winchester Repeating Arms Company. He was a charter member of the Army Ordnance Association.

Colonel Diemer was chairman of the Chicago Section of the Taylor Society, 1924-1925; president, Chicago Chapter, Society of Industrial Engineers, 1925, and national vice-president, 1930-1935; chairman, Chicago Section, American Society of Mechanical Engineers, 1926-1927; national vice-president, Society for Advancement of Management, and one of the founders and the first chairman of the Chicago Management Council. In January he was awarded the Taylor Key by the Society for Advancement of Management in recognition of outstanding contributions to the science of management.

CLARENCE I. B. HENNING, a life member of the Army Ordnance Association and retired technical adviser in the military sales division of E. I. du Pont de Nemours & Company, died January 26th at his home in Berkeley, Calif., at the age of 57. During the war, Mr. Henning became known internationally as a smokeless-powder chemist. In 1917, he was lent by the Du Pont Company to the British Ministry of Munitions in London where he served as technical adviser on explosives.

Mr. Henning was educated in the San Francisco public schools, the California School of Mechanical Arts and the University of California. He gained his first experience in explosives chemistry as assistant to W. B. Rising, dean of the college of chemistry of the University of California, making analyses of glycerine, wood pulp, minerals, and explosives.

In 1901, Mr. Henning became associated with the California Powder Works at Pinole, Calif., as a chemist. He was employed by the Du Pont Company in 1907 as chemist at the Haskell, N. J., smokeless-powder plant. In 1913 he was appointed ballistics engineer at the company's experimental station in Wilmington, Del. In 1921 he was made assistant director of military sales in charge of technical matters of the explosives department, a position he held until his retirement in April 1932.

NOTICE also has been received of the death of the following members of the Association: S. E. Haines, Philadelphia, Pa.; C. T. Marsh, Pittsburgh, Pa., and Sverre Skagen, Pittsburgh, Pa. To their relatives and friends ARMY ORDNANCE, on behalf of the Association membership, extends condolences.

From the Record

The following quotations are from addresses or writings of recognized authorities and comprise a cross section of opinion on subjects closely allied to the national defense. They have been selected for publication as being important and timely. Through this medium, ARMY ORDNANCE *hopes to acquaint readers with official views regarding various phases of industrial preparedness.*

IN CONSIDERING PREPARATION OF OFFICERS OF the Army of the United States for assumption of war-time duties, we encounter some rather startling figures. Of the total of approximately 127,000 active commissioned officers in all three components of the Army, less than 22 per cent have seen service in time of war. We must no longer picture future war-time American armies as being led primarily by war-experienced commissioned personnel. Nor must we permit any such picture to be impressed upon the public mind.

Of the officers of even our Regular Army, barely fifty-three per cent were in the military service during the World War. An estimate for the National Guard gives an approximate figure of forty per cent with war-time experience. When we reach the Organized Reserves, we find that barely 15 per cent of the 100,000 members of the Officers' Reserve Corps in the eligible category saw active service during the great conflict of 1917-1918. Age and physical disability take their rapid toll in the commissioned ranks of the Army of the United States. Particularly is this true of that component represented by the Reserve Officers' Association.

The continuous loss to the active lists of war-experienced personnel makes the problem of adequate peace-time training one of considerable concern to the War Department. No peace-time training, however prolonged may be the period of years over which undergone, can serve as a substitute for war-time experience. Especially is this true in our country, where limited forces, limited facilities, and limited funds do not permit those massive peace-time maneuvers and field exercises which characterize the instructional activities of the great conscript armies in other sections of the world.

In the current proposals for augmentation of our defensive strength, we hear much about modernization. Even now we are testing the organization of the infantry division with a view to substitution of that bulky relic of World War days by a more modern, more mobile, and more easily handled unit. In very recent years, we have also modernized our mobilization plans for procurement of personnel and matériel in the event of major emergency. As is true of the infantry division organization, so the mobilization plan which we discarded a few years ago dated back to World War days and presupposed 1917-1918 conditions. It would appear that the time is now opportune for modernization—if I may use that term in this connection—of policies and regulations governing the Reserve component of the Army. Those policies and regulations were initially promulgated shortly after the World War by veterans, both of the permanent establishment and the Reserve components, who visualized potential employment of the Organized Reserves in the light of conditions which obtained after the Armistice of November 11, 1918. The United States then possessed a huge reservoir of 4,000,000 highly trained men. Initially, one hundred per cent of the membership of the Officers' Reserve Corps comprised war veterans. That was some twenty years ago. That percentage has now fallen to fifteen.

The thought that I wish to leave with you is that consideration

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should now be given, it would seem, to revision of Reserve regulations with a view to meeting the conditions which exist today, and will exist tomorrow, rather than a situation which obtained two decades ago.—*Hon. Harry H. Woodring, Secretary of War, to the Reserve Officers' Association, Washington, D. C.*

THE NATURE OF THE NEEDS OF OUR ARMY TODAY are the exact opposite of our requirements in 1917. Then we thought only in terms of men—men literally by the millions. Today we talk in terms of munitions and for a conservative quantity of these. The reasons for this change in attitude are obvious. In 1917 we were preparing to send an expeditionary force across the seas. Today we are organizing to equip an army in defense of our own homes.

In 1917, we were entering the war to fight beside nations industrially geared for battle. They had the material but were short of man power. We had the men but were without an adequate supply of munitions. We came to terms. We offered the flower of our manhood. Our Allies gave us the choice of their munitions. We fought with heavy howitzers and rifles of a British model and wore protective helmets of a British design. We fired French rifle grenades and advanced behind a barrage laid down by French 75's. Vessels of our Allies helped bridge the Atlantic for us to cross. Planes from their factories hovered in the air for us to fly.

Today the foreign munitions markets are closed to us. Every nation in the grip of war or the dread of its outbreak is keeping its best weapons at home and turning to outside markets in the hope of picking up some improved types and models. Particularly has this become true of modern aircraft. If we suddenly needed military weapons in quantity and with speed, we would have to look entirely to ourselves. It behooves us, therefore, to develop our own munitions.

As the first step in munitions preparedness, the War Department would like to get enough equipment to meet the needs of every officer and enlisted man of the Regular Army and National Guard for M-day. There are approximately four hundred thousand men in these two groups. They are the Minutemen of today. They are entitled to the best of munitions and to the full quota of their needs.—*Hon. Louis Johnson, Assistant Secretary of War, to the Chicago Association of Commerce, Chicago, Ill.*

I AM IN FAVOR OF DISARMAMENT IN THEORY, but I am not in favor of it in practice as we have practiced it heretofore. We were moved by a lofty idealism. We were willing to scrap battleships if other nations did likewise in behalf of peace. If the other nations would all disarm, fine. I am reminded, however, that the other nations of the world are somewhat like an historic example.

It is related that the great Bob Toombs, a brigadier general in the Confederate Army and a former Member of Congress, was one of the fire eaters in the South before the Civil War. As the war was coming on he boasted that his people from Georgia and elsewhere in the South could whip the Yankees with cornstalks. After the war was over, and Toombs was again a candidate for public office, one of his friends twitted him. He said, "Look here, Bob, you told us that we could whip the Yankees with cornstalks. What about it?" "Well," Toombs said, "now, look here, old friend, we could have done it, but they would not fight us with cornstalks."—*Senator Tom Connally, in the national defense debate, U. S. Senate.*

THE NEW MATÉRIEL IS ADDRESSED TO THE remedy of these deficiencies [lack of effective high-angle weapons, lack of efficient tactical transportation, and lack of effective flanking fire on the offensive]. The rifle company will have 3 very mobile 60-mm. mortars, the battalion 2 more powerful, but

not quite so mobile, mortars of 81 mm., and motor transportation capable of keeping the heavier weapons and their ammunition in the forward combat zone. In addition, the rifle company will have four light machine guns mounted on tripod, but much lighter than the Browning heavy machine gun, capable of closely following the advance of rifle companies and insuring flanking fire in support of their advance.

A reorganization of the infantry regiment consequent on the new armament has been approved by the War Department.

The new M1 semiautomatic rifle with which our infantry is now being equipped is a superior weapon and greatly increases the fire power and accuracy of fire of the individual rifleman. Reports received in my office since the adoption of the M1 rifle indicate that it has functioned most satisfactorily in the hands of troops and that its maintenance cost is very low.

A solution of the offensive problem is also sought through development of the tank, which in primitive form had demonstrated its value in the World War. For some time after the World War, development took the direction of increased speed, but in recent years, heeding the lesson of the Spanish war, we have sought to increase its powers through increased armor protection and more powerful armament.

The primary mission of the tank in the attack is to dominate hostile machine guns. For this mission the light tank appeared to be adequate prior to the appearance of the antitank gun. The latter weapon has made it necessary to provide two echelons of tanks: a leading echelon consisting of medium tanks whose mission is to dominate with their fire antitank guns which have not been suppressed by the artillery—these tanks are manned and armed so as to be capable of a considerable degree of self-defense at some distance from supporting infantry—and accompanying tanks which do not ordinarily advance beyond the close support of infantry but maintain close contact with it.

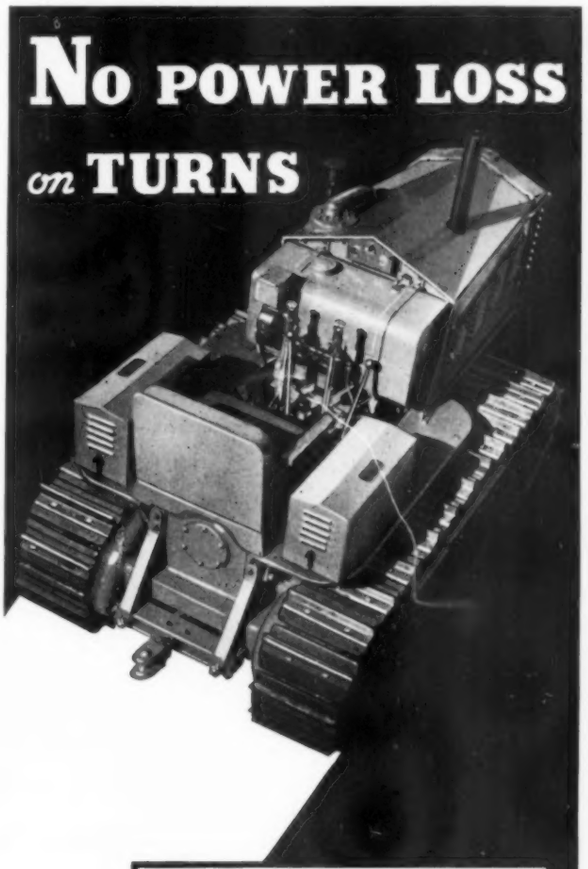
After a comparison with foreign tanks based on such information as we have been able to collect, it is believed that we have better light and better medium tanks than other armies. However, a machine is always susceptible of improvement and in future we advocate replacing the caliber .50 machine gun in the light tanks with the 37-mm. cannon on account of its superior armor-and-concrete-piercing ability. Thus far I have not advocated the construction of heavy tanks because they can be moved into the combat zone only on railroads, and because their radius of action is extremely limited due to the fact that but few highway bridges will bear their weight.

Our antitank gun which has been standardized and which is now in process of manufacture has the ability to pierce two inches of armor plate at 730 yards. This means that it can put all but the heaviest tanks now known out of commission.

In conclusion, I think it may be in place to remark that in the opinion of my office, our standard infantry armament is the equal if not the superior of that of any other infantry in the world, and our infantry regiments, when their rearmament has been completed, will be capable of meeting any of the exigencies of modern warfare.—*Maj. Gen. George A. Lynch, Chief of Infantry, U. S. Army, before the Committee on Appropriations, House of Representatives.*

UNDER ORDNANCE SERVICE AND SUPPLIES there are funds provided for forty-four 75-mm. M2 carriages. This weapon for the Field Artillery of the Infantry division is a modernized gun, the result of postwar progress in armament. The number requested is to provide for the rearmament of Regular Army active units with modern light weapons and to provide an additional battery for the United States Military Academy.

There are also funds requested for eight adapters for the 155-mm. howitzer, M1918A1. They are required to provide high-speed carriages for units of the Initial Protective Force. There are also funds requested for one battery of 105-mm. howitzers. That is to provide one battery for extended service test of newly developed modern matériel.



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There is also provision for seventy-five aiming circles, M1. That is to provide this modern item of essential fire-control equipment for active units of the Regular Army. There is also provision for one battery of 75-mm. field howitzers, M3A1, complete. That is to replace a nonstandard pilot battery for use by artillery assigned to the mechanized force.

Under research and development we are asking for the following: An antitank gun not exceeding 75-mm. in caliber; the continuance of the development of the 105-mm. howitzer; one battery of 8-inch howitzers for extended service tests.

We are also asking for provision for the continuation of the development of a modern, longer-range 155-mm. howitzer; for limbers and caissons for the 75-mm. howitzer, horse-drawn; for a boot or carrying case for the semiautomatic rifle; for an investigation of the suitability of commercial track-laying vehicles for field artillery use or their adaptation thereto; also movement of field artillery carriages by wheeled tractors; and for improvements in the 75-mm. howitzer and the development of close-support accompanying weapons.—*Maj. Gen. R. M. Danford, Chief of Field Artillery, U. S. Army, before the Committee on Appropriations, House of Representatives.*

THE BASIC MISSION OF THE ENGINEERS IN WAR is to assist the operation of the field forces by means of engineering works. Engineer troops consist essentially of organizations of technical specialists and skilled labor, designed to increase the combat efficiency of other arms through the execution of work-facilitating movement, increasing their defensive powers and providing for their shelter and water supply.

By all means the most important of these functions are those which give mobility to our own forces and deny it to the enemy. The modern armies of today, with their completely motorized transport, are to a greater degree than ever before dependent upon an adequate network of suitable highways and railways. Otherwise their potential powers of mobility are of no avail. Moreover, the communication net is far more susceptible to interruption and damage due to the advent of the modern long-range bombing plane, extending the probable zone of destruction far to the rear of the front line, and the development of highly mobile mechanical equipment for the ready execution of mass demolitions. It is to be observed also that the rapidity of bridging and other means for restoration of such destructive measures has by no means increased correspondingly. Accordingly, it may be anticipated that the magnitude and difficulty of the tasks of the engineers in facilitating movement will be greater than in the past.

Provision of means for blocking the rapid advance of enemy mechanized units has become an important duty of the Engineers and is a task that will tax their ability, as well as that of other arms, to the utmost. Barriers, antitank mines, ditches, and obstacles will all be required on a large scale, due to the ability of these vehicles to operate across country.

Adequate maps have become a vital necessity in military operations in almost any probable theater of war, including the greater portion of our own country, and such maps are at present lacking and must be provided. Provision for the production of such maps in time to be of use is a most important task of the Engineers.

Another important Engineer task is that of general construction in the theater of operation, a vast program which includes barracks, hospitals, supply depots, utilities, and landing fields for the air force. In addition, the Engineers furnish technical supervision and supply of materials for defensive works and for camouflage. Still another important task is that of water supply.

Thus the mission of the Engineers, while essentially unchanged, has become increasingly important under the conditions of modern warfare.—*Brig. Gen. John J. Kingman, Assistant to the Chief of Engineers, U. S. Army, before the Committee on Appropriations, House of Representatives.*

Professional Digest

The following abstracts are based on current periodicals and events and aim to present a wide range of facts and opinions regarding recent developments of professional military interest. Quotation marks are omitted but sources are indicated.

AN INITIAL APPROPRIATION OF $3,000,000 TO BEgin a 5-year replacement program has been requested by Maj. Gen. Henry Gibbins, Quartermaster General of the Army. Funds were received from Public Works Administration for the purchase of 7398 general-purpose motor vehicles for the Regular Army in fiscal years 1934 and 1935. No replacements have heretofore been provided for these vehicles and only limited amounts for replacement of other motor vehicles purchased prior to those years. The average age of the vehicle now on hand is in excess of four years.

THE ORDNANCE DEPARTMENT LAST MONTH established a gage laboratory at the Carnegie Institute of Technology, thus considerably increasing facilities for research and industry in the Pittsburgh district. The primary purpose of the laboratory is to make available standard measurements of the greatest accuracy for the machines which produce Army equipment. More than $20,000 worth of delicate precision instruments, accurate to the hundred-thousandth and millionth of an inch, will be installed in a laboratory in Industries Hall at Carnegie Tech.

The laboratory will be operated under the general supervision of Dr. Webster N. Jones, director of the College of Engineering at Tech, and Maj. C. H. Morgan, executive officer of the Pittsburgh Ordnance District. Prof. C. C. Leeds of Carnegie will be in charge of the laboratory.

The equipment makes possible measurements within two-millionths of an inch by means of the Van Keuren light-wave equipment used to determine the wear on Johanssen precision measuring blocks or diameters of ball bearings and similar measurements where great precision is essential. Another piece of equipment measures length to the hundred-thousandth of an inch. Other apparatus includes a screw thread testing machine, comparators, microscopes, micrometers, surface plates, straight edges, levels, parallels, and squares. All precision equipment has been calibrated at the U. S. Bureau of Standards, and the tabulated calibrations are part of the laboratory records.

The Ordnance Department will use the laboratory to train Ordnance Reserve officers as Army inspectors of ordnance, and employ its facilities to calibrate and inspect gages on current manufacturing orders. The laboratory will be of tremendous value for national defense in the event of emergency by facilitating check of inspection gages and accelerating of inspection work. Industries in the district also will use the equipment. (See "Ordnance Gage Laboratory at New York University," by Maj. Carlos de Zafra, Ord. Res.; ARMY ORDNANCE, March-April 1938.)

AN EFFECTIVE MEANS OF STOPPING WHEELED armored vehicles has been adopted by several foreign armies. A wire obstacle that looks very much like a concertina has been found to be very effective as a road block to stop wheeled armored cars—the vehicles becoming so entangled in the wire that they cannot proceed. Success has not attended the efforts to manufacture the obstacle wire in this country, but tests have indicated a design that may be effective. Another solution will be sought, according to the *Army and Navy Register*.

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Functioning: Severe firing indicates that the Johnson rifle is not dependent upon any lubrication for reliable functioning. The Johnson rifle has fired 2400 continuous shots in ninety minutes without cleaning, oiling, or cooling. **Accuracy:** Proven extremely accurate in many field tests. **Manufacturing:** Maximum and minimum models have been made from production drawings to prove the manufacturing limits and absolute interchangeability of parts from one rifle to another. Thus, Johnson rifles can be manufactured in vast quantities on relatively short notice under ordinary mass-production methods. **Military Training:** Ease of handling and unusual simplicity of mechanism enable quicker training of riflemen than is possible with ordinary bolt-action rifles. **Reference:** See November 1938 issue of "The American Rifleman" magazine.

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DESIGNED BY LIEUT. COL. JAMES C. LONG OF THE 329th Engineers, a Reserve Engineer regiment, three sets of grips for the caliber .45 automatic pistol have been received by the Cavalry Board for test. These grips are of wood with deeply corrugated surfaces in place of the conventional checked design. The ribs of the corrugations, it is said, will reduce movement of the pistol in the hand due to recoil. The test will determine whether the grips designed by Colonel Long are of sufficient advantage over the issue items to warrant further War Department action.

A REVISION OF ARMY REGULATIONS PERTAINING to the guidon for the Ordnance service company changes paragraph 6b (10) of A. R. 260-10, November 20, 1931, to read as follows:

"(10) Ordnance Department.—The color of the guidon will be crimson. The device will consist of a shell and flame eight inches in height. Below the device will be the designation of the company, as follows:

"Ordnance companies, except service—The number of the company.

"Service companies—The number of the company followed by the letter S.

"Device, numerals, and letter will be yellow."

NO DEFINITE DECISION HAS BEEN MADE PERtaining to the use of the autogiro by the military establishment, according to the *Army and Navy Register*. Fifty-four various Government activities are interested in autogiros, and in view of the fact that no two of them want the same kind of an autogiro, the Air Corps first plans to do some experimental work. It has been proposed to purchase nine of this type of aircraft and send them to the different departments to determine what type of autogiro is desired. There is a difference between the autogiro and helicopter. The helicopter, by virtue of its center rib, is able to shift vertically. The autogiro, by its rotating vanes, has a forward as well as an upward pull. One can go straight up, and the other can go almost straight up but not quite. It is the difference in the application of the vanes. One has a propeller that pulls it upward with a lifting vane, while the other has only a lifting vane. Up to the present, there has been little time devoted to the helicopter in this country. It appears that Germany is the only nation that has a practical helicopter. Maj. Gen. H. H. Arnold, Chief of the Air Corps, recently said:

"We have had tests at some of our posts in the United States where we used the observation plane, the autogiro, and the motorized balloon. We found out, for instance, that at dusk and early dawn the motorized balloon has a distinct advantage over the other two, and at other hours during the day the autogiro has distinct advantages, while for still other missions the airplane has advantages. The advantages and disadvantages have not yet been evaluated, so right now it is impossible to say just which of the three types of aircraft is best for observation purposes. We are also undertaking experiments with a fourth type of aircraft in the form of a slow-speed airplane which can hover almost like an autogiro. We believe that it may have all of the advantages of the autogiro and probably eliminate some of the disadvantages."

ENGAGED FOR AN EXTENSIVE PERIOD IN PERfecting defensive means against the airplane, the Ordnance Department has developed a highly effective weapon designed to fight aircraft. The new gun is described as 37-mm., automatic type, mounted on an all-around-fire, 4-wheel trailer which may be towed by a light truck at maximum speed. The unit has a wheelbase of 120 inches, with a 58-inch tread, and weighs about 5000 pounds. In the ground defense against aircraft, gunnery in the higher altitudes has proved more satisfactory than that designed to defend against the high-speed, low-flying attack planes. For some time the Army has not possessed an automatic weapon

capable of going into action instantly and of delivering a heavy volume of fire with an explosive bullet. Tests of this new 37-mm. antiaircraft gun have been so satisfactory that it has been standardized for issue.

A FURTHER DEVELOPMENT OF THE FLYING-fortress type bomber recently arrived at Wright Field, the experimental station of the Army at Dayton, Ohio. The bomber incorporates various minor improvements found desirable as a result of more than a year's service test of this type at Langley Field, Va. It is the first one to be delivered of the thirty-nine now being manufactured under previously awarded contracts.

The new Boeing YB-17A is identical in size and similar in general design to the thirteen Boeing B-17 flying fortresses now in the Army's service which were used on the good-will flight from Miami to Buenos Aires on February 15th, and to Bogota, Colombia, on August 5th.

The new airplane is powered with four Wright "Cyclone" engines. By means of blowers, or superchargers, turning at high speeds, air is fed to the engines at approximately constant sea-level density, although the airplane may be at 20,000 feet. This rarified air is first compressed to sea-level density, then cooled by radiators, both operations being performed before it enters the carburetors. By means of these superchargers, the approximately maximum power output of the engines may be maintained in spite of a decreased density of the air at high altitudes.

The new YB-17A, like the previous YB-17 delivered in 1937, is a 22-ton all-metal, low-wing monoplane of some 105 feet wing span by 70 feet in length, and has an over-all height of 15 feet. These bombers can fly at speeds in excess of 250 miles an hour, carry 5 machine guns and a crew of 7 to 9 men, including a commanding officer, pilot, copilot, navigator, engineer, bomber, radio operator, and gunners. All members of the crew can change stations freely, and for long flights, sufficient additional personnel can be carried so that the operators of the airplane may be relieved from time to time and get the necessary rest.

DEVELOPED BY THE AIR CORPS MATÉRIEL DIVISION at Wright Field and recently tested by the GHQ air force at Langley Field, a 34-foot radio-controlled high-speed marine target is being tested by the Coast Artillery Board to determine its serviceability and seaworthiness. The target will be used for tracking missions only to determine limits of visibility from shore stations and from airplanes. The radio-control features, when the target is running straight and variable courses, will be tested with the control transmitter operated from harbor boats and from an airplane.

The Coast Artillery Board was expected to conduct tests on the reconditioned 28-foot Gar Wood radio-controlled high-speed marine target, which was developed by the board and on which has been installed a new control mechanism. This boat will be used for tracking missions and as a target during the firing of one hundred rounds of 155-mm. ammunition in connection with tests of the autogiro for aërial position finding for seacoast artillery.

THE WAR DEPARTMENT HAS ANNOUNCED WHAT officers believe to be the first change in the commands for executing the manual of arms since about 1867.

For all troops equipped with the Garand rifle, the new regulation stated, the inspection arms command will be: 1. Inspection; 2. Arms; 3. Lock pieces. The inspecting officer then takes the piece. At dismissal, the pieces are inspected at the commands: 1. Inspection; 2. Arms; 3. Port; 4 Arms: Triggers are pulled at the command, "Arms."

War Department officials said, according to the *Army and Navy Register*, that the commands for executing the manual had changed very little since 1829. The only specific change they were able to find since that date was one made about 1867 when

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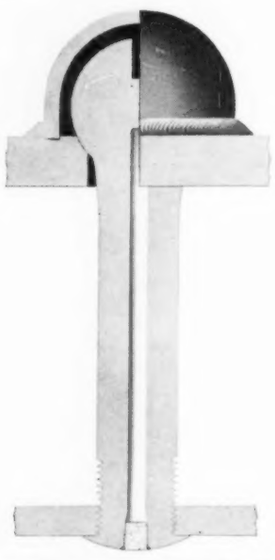

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ramrods were discontinued. Up to that time, "Order arms" was executed much in the same manner as today except that the soldier at command sprung the ramrod into the muzzle of the gun before surrendering it to the inspecting officer.

THERE ARE TWO SCHOOLS OF THOUGHT AMONG Cavalry officers as to the type of reconnaissance vehicles best suited to the needs of that arm of the service, and to help solve the problem a number of new reconnaissance vehicles will be procured for issue to Cavalry horse regiments in the 1940 fiscal year and subsequent years. The Cavalry Board at the present time is working on recommendations regarding the military characteristics of the proposed new cars. One school of Cavalry thought believes the ideal reconnaissance vehicle for horse units should be a light, unarmored car which would be fast, very flexible, and possessing a high degree of cross-country mobility. This type of vehicle, represented by the Marmon-Herrington (Ford) 4 x 4 chassis, and which the Cavalry Board has under study at the present time, would depend for protection upon speed, mobility, and fire power. This vehicle would be inexpensive and easy to produce.

The other school of thought in the Cavalry holds to the belief that the Army should continue development along the lines already established in the present M3 scout car, that the ideal reconnaissance vehicle should be armored at least to protect it against small-arms fire, and that in general it should possess the characteristics of the M3, except that it should have a better horsepower ratio, shorter turning radius, and lower silhouette. The hull of this car, it is pointed out, probably could be redesigned to improve seating arrangement. Commenting briefly on reconnaissance vehicles, the Cavalry Board made the following observations:

"Very few Cavalry officers, however, believe that we should attempt to provide armor protection in reconnaissance vehicles beyond that which would effectively protect against small-arms fire, as to go beyond this would so increase size and weight and decrease flexibility and mobility as to make it unsuitable for reconnaissance. Track and half-track vehicles have also been considered, but, in their present state of development, apparently do not possess as many of the characteristics desired as do the wheeled vehicles with all wheels power driven. A number of valuable suggestions as to improvement of reconnaissance vehicles have been submitted by Cavalry officers who are operating these cars under field conditions. The board is always glad to receive and consider these suggestions, and it is hoped that others will be received."

INDEX TO ARMY ORDNANCE
VOLUME XIX

This issue concludes the nineteenth volume of ARMY ORDNANCE. *The index to Volume XIX, with title page for binding, is now in preparation. It is arranged alphabetically by subject and author. Copies of the index will be furnished to members and subscribers without cost upon application to the Editorial Offices, Suite 806, Mills Building, Pennsylvania Avenue at 17th Street, N. W., Washington, D. C.*

Ordnance in Review

ROCKETS, PART II

BY LIEUT. COL. CALVIN GODDARD, ORD. RES.

WHEN the modern American sings of "the rockets' red glare, the bombs bursting in air," he is hardly conscious of the full meaning of these phrases. For on that memorable night in September 1814, Congreve's brain child was being given a real try-out. The rocket which glared redly and the bomb which burst thunderingly over the bastions of Fort McHenry, were one and the same missile. Indeed, so intensively was this new agency employed on this occasion that several vessels especially fitted out as "rocket ships," accompanied by a number of naval barges, were delegated to ascend the Middle Branch of the Patapsco and take the fort in the rear. Fired upon, however, by three batteries of whose existence they apparently were ignorant, they were forced to retreat after the loss of one barge with its full complement of men.

But though the rocket failed in this instance to accomplish its objective, it already had left its mark, and that an indelible one, on American history. For, only some three weeks previously, at the battle of Bladensburg (August 24, 1814) a flight of these ungainly projectiles directed against Stansbury's brigade had caused the regiments of Schutz and Ragan to break and flee in wild disorder. As a result, the American flank was turned, and despite stout resistance on the part of the Fifth Maryland Infantry under Sterrett, the day was lost.

Thus we may indirectly (or perhaps directly) thank Congreve and his invention for the capture and burning of Washington which followed. It would be interesting indeed to unearth some eyewitness reports on the effectiveness of this instrument of war in the Bladensburg encounter. These may exist, but such sources as I have been able to consult thus far have not disclosed them.

UNFORTUNATELY, there appears to be a uniform absence of authentic record of *specific* accomplishments by members of the rocket family. Vague statements as to their relative accuracy are offered, such as that of Charles Dupin (Paris, 1820) in his report on studies as a military observer in England over the years 1816-1819. He says: "In the summer of 1819, comparative tests were made between rockets and field artillery [the latter] firing a medium-range shot. More rockets than cannonballs struck the target." He proceeds, however, to add the following naïve note: "The author received this information from an eyewitness of the tests."

Against this we have the observations of Capt. Joseph Bem of the Polish Light Field Artillery who records (1820) that "in the campaign in Louisiana and Florida in 1815, the English killed but ten Indians altogether with their rockets." But since he fails to give any indication of the *extent* to which rockets were employed in this campaign, his comments are difficult to evaluate. Further, the wily Redskin, unlike his white brother, was never wont to foregather in dense masses when waging war, and probably offered a very difficult and elusive target to the rocketeers arrayed against him.

Bem (a Frenchman) undertakes to belittle the damage done by Congreve's missiles at the siege of Boulogne (See Part I, ARMY ORDNANCE, March-April, 1939), when he says: "It is certain that their reputation was not established until after the British had succeeded in setting fire to the city of Copenhagen (1807) by means of these rockets. They had previously been employed against the shores of Boulogne, and *although they produced no effect* [italics mine], the French nevertheless be-

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gan to give them consideration to the extent of making up a few and using them against the British fleet which, at the siege of Danzig in 1813, was bombarding Fort Weichselmünde. One of the first [rockets] fired by the English in that siege ignited a house, but prompt measures taken following this kept [other] rockets from having the least effect. It is claimed that at Leipzig (1813) [where they were] employed against cavalry, and especially at Algiers (1816) [when used] against that city, they rendered signal service."

Bem is inclined to discredit the potentialities of the rocket as a competitor with artillery shell but believes it has a real place as an incendiary missile, especially under the following circumstances: (1) When ranges are considerable, and beyond those at which licornes can be successfully employed, or where mortars are not available. (A licorne was an improved light howitzer adopted by the Russians in 1777.) (2) In positions impracticable to artillery but where rockets and their projecting apparatus may be transported by hand.

He proceeds to enumerate the maximum ranges (1 sagene = 7 feet) of the licornes of the day, as compared with those of heavy war rockets (caliber not given), the figures being all in favor of the latter. Thus:

Matériel	*Range*
1-pounder licorne (artillery)	844 sagenes
½-pounder licorne (artillery)	975 sagenes
¼-pounder licorne (artillery)	962 sagenes
¼-pounder licorne (cavalry type)	768 sagenes
Heavy rocket	1100 sagenes

DISREGARDING for the moment the rocket's virtues and defects, the fact remains that as an instrument of war it attracted world-wide attention for many decades, and appears to have been introduced, to some extent at least, into most of the major armies of the period. Indeed it was not declared obsolete in the forces of Great Britain (so I am informed by a retired English officer) until somewhere about the turn of the century when a fire of considerable magnitude broke out at Woolwich Arsenal. This consumed, among other things, a great store of rockets, and for a time the air was filled with the swishings of these missiles. Armed with war heads, some explosive and some incendiary they constituted no small hazard both to the military attempting to suppress the blaze, and to the citizens of near-by London. But *not a single casualty resulted*, and British bigwigs decided that if such a concentration of these projectiles over a limited area could prove so innocuous, their military usefulness might well be declared at an end. On behalf of the rocket, thus summarily stricken from the supply tables of Her Majesty's forces, it may be pointed out that had an equal number of these been discharged by human agency, and at a definite target, results might have been quite different. Be this as it may, its knell was sounded.

The date of the adoption of the rocket by the American military establishment I have not been able to determine. Thus Duane (Philadelphia, 1810), though devoting considerable space to *signal* rockets, makes no mention of the use of those of explosive or incendiary nature by civilized armies. He does refer at some length, however, to the "fougette"—a type of rocket employed by the East Indians of the day, quoting a then recent work by a French officer who describes this as "in shape resembling a skyrocket whose flight is gradually brought to run along an horizontal direction. By throwing several fougettes into parks of artillery and upon the caissons, etc., considerable damage might be occasioned from the fire which would inevitably be communicated to some part. A fougette forces itself immediately forward, cuts as it penetrates, by the formation of its sides, which are filled with small spikes, becomes combustible and on fire at all its points, and possesses within itself a thousand various means by which it can adhere to whatever object it is destined to set on fire or to destroy." (*To be continued.*)

Book Reviews

LEE, GRANT, AND SHERMAN, A STUDY IN LEADERSHIP IN THE 1864-65 CAMPAIGN. By Lieut. Col. Alfred H. Burne, British Army. With an Introduction by Douglas Southall Freeman. New York: Charles Scribner's Sons. $3.00.

IT is a striking fact that the first soldiers to consider seriously the military importance of the study of the American Civil War were British officers. In taking up the work so well begun by Henderson, Maurice, and many others, Colonel Burne not only keeps to the best tradition of his fellows, but strikes out boldly to create a method and an atmosphere of his own.

As the author has chosen to center his present work upon the last year of the Civil War, he devotes the first chapter to a rather thorough comparison of the resources, arms, equipment, forces, and morale of the combatants. A description of the topography involved and a summary of the first three years bring the reader to April 1864. Then follows a narrative of the situation at that time. Thus does the author escort the reader onto the field, equipped to follow him through the ensuing campaigns. Moving on through the heaviest sustained fighting of the entire war—the battles of the Wilderness, Spotsylvania, North Anna, and Cold Harbor—and following Grant in his great movement of the James River crossing, Colonel Burne turns to a different theater of conflict.

Before opening his study of the Atlanta campaign, he again prepares the reader with a detailed explanation of that arena of the war. The struggles of Sherman with Johnston, and later with Hood, are given masterly treatment. After an appraisal of Hood's Tennessee campaign, and of Sherman's March to the Sea, the reader is returned to Virginia. The discussion devoted to Jubal Early's campaigns in Maryland and in the Shenandoah Valley well shows their importance. The winter of the siege of Petersburg is briefly outlined. Then Grant and Lee are left to their temporary stalemate, while Colonel Burne studies the advance of General Sherman through the Carolinas. Returning for the last time to Virginia, the author brings his book—and the war—to a close with an excellent analysis of the Appomattox campaign. The maps are excellent.

Colonel Burne's appraisal of the generals discussed runs somewhat in this fashion: Sherman possessed a splendid and most active mind but was lacking in both moral courage and in a true understanding of the art of war. General Grant rates as an excellent army commander and, though pertinacious and intrepid, he lacked the quick imagination needed to exploit his gains. Among Lee's qualities which rank highly are his Christian character, his flawless logistics, and his great ability to divine the intentions of an opponent. The conclusion with which Colonel Burne ends the volume is that decisively "the student must feel that the military leader par excellence to whom he must pay homage is Robert E. Lee."

Nor does the author neglect the secondary leaders whom he portrays. Indeed, his estimate of several of them shows his bold independence of thought more clearly than does any other feature of his work. Thus he rescues Hood and Early from the well-nigh unanimous condemnation (at least by faint praise) showered upon them by previous historians. Thus too his frank statement that though a dashing and most successful cavalry leader, Phil Sheridan was a failure as an army commander. By his definite relative ranking of these leaders, Colonel Burne displays a rare courage which most critics avoid to a greater or lesser extent.

The author is definitely of the "attack school" of military thought. The internal evidence which he produces therefor, together with the lesson already being drawn from the recent

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Spanish War, seems ample justification for his position. His confidence in, and his willingness to stand or fall by, his own considered judgment give an atmosphere of inspiring frankness to his writing. This is well balanced by his careful consideration of all the factors which may affect a leader or an action. Dr. Freeman especially notes this characteristic in his introduction to the book.

The only criticism which this reviewer would venture to make is that Colonel Burne takes up the Civil War so near its conclusion. The statement in nearly the first chapter that "Longstreet fell exactly *two* years after Stonewall Jackson," places Jackson's death at the battles around Richmond, in 1862, thus conveying a slight sense of incongruity. In spite of this, "Lee, Grant, and Sherman" is surely very near the top of the list of required readings for every student of the great all-American conflict. The tremendous value of such study to the modern soldier is summed up in the amazing but well-evidenced statement of Colonel Burne, that owing to peculiarities of terrain "a war fought today in Virginia would not be very different in condition or method." F. W. F. G.

AMERICA AT WAR, 1917-1918. By Frederic L. Paxson. Boston: Houghton Mifflin Company. $3.75.

PROFESSOR Paxson, who is professor of United States history in the University of California, confirmed his eminence as a military-economic historian in his earlier volume, "Pre-War Years, 1913-1917." We have no hesitancy in saying that, having studied many histories of our World War effort, particularly from the view of the preparedness program, this work is easily the most objective, best-balanced, and generally satisfactory.

Professor Paxson deserves a hearty "thank you" for his well-modulated statement of our armament problems of 1917-1918 and his appraisal of the men who attempted to solve them. He presents the story of our successes and failures in mobilizing man power and industry in the World War. The vast panorama is described in sufficient detail to emphasize each salient point of the record. We doubt that a more complete and at the same time more objective volume on how and why we went to war will appear. Nor could there be a more temperate, factual statement of the *tour de force* "which had for the first time mobilized for a common purpose the imagination, man power, and material strength of American democracy." E. N. O.

THE GENESIS OF THE AMERICAN FIRST ARMY. Prepared in the Historical Section, Army War College. Washington: U. S. Government Printing Office. 50 cents.

THIS neat little book of eighty-two pages has much to be said for it. Its method shows the scholarship of some of the eminently qualified historians of the Historical Section; its style discloses the genius of some of our Army specialists, long acknowledged to be among our few qualified military historians—a select band to be counted on the fingers of a hand and a half. Needless to say, the facts presented are authenticated by best evidence. The volume shows a panorama of the United States going to war (the period from April 6, 1917 to March 21, 1918; *i.e.*, from our declaration of war until the beginning of the German offensive of 1918); the preparation for battle (the period of the German offensive, March 21st to July 19th); and the battle (the period of concentration, July 18th to September 12th). The latter describes in detail the formation of the First Army in the Chateau-Thierry region; plans to shift the First Army theater of operations to the St. Mihiel region and the concentration of the army in that region. The appendices are especially noteworthy not only for the division and corps types of organization described but particularly for the reproduction of historic correspondence connected with General Pershing's momentous negotiations for the formation and employment of the American First Army. For this fine narrative all praise to those who have labored so faithfully and so long in its preparation.

But our praise is not unmixed with criticism. This 82-page book is a very sad commentary on the value the people of the United States place upon their military history. After twenty years, our glorious tradition as embodied in the record of the American First Army appears in the size and format of a village telephone directory! It bears the imprint of the Historical Section of the General Staff—as though any history can be written to advantage in this impersonal fashion. As well imagine Freeman's "Lee" not by Doctor Freeman but by a Committee on Confederate Records! R. E. Lee is all the greater because he has had his Freeman.

For years we have read in the daily press of Federal Writers Projects spending untold sums for codifications of secondary information, much of it of no particular value except to emphasize various shades of strange beliefs ranging from the ultra-red to the infra-pink. Unless our military historians are to be given ample facilities and their works—*over their individual signatures*—fittingly printed and bound, better disband the enterprise and go to soldiering for the day when—our glorious military history forgotten—the narrative is continued not by the pen but by the sword. Not a Government seed catalogue but looks more imposing than this magnificent matter here presented in such forbidding format. L. A. C.

BREATHE FREELY! THE TRUTH ABOUT POISON GAS. By James Kendall. New York: D. Appleton-Century Company. $1.50.

DOCTOR Kendall is professor of chemistry at the University of Edinburgh. He has given much of his time and effort to the facts of poison gas and air bombing. Here, in language everyone can understand, he presents the considered opinion of an authority on chemicals in war.

Written by an Englishman primarily for British readers, this book ought to be one of the best antipanic prescriptions in the British Isles. Every resident of the thickly populated East End of London ought to be made (under democratic processes, eh what?) to memorize it. And that goes for West Enders too. Most in need of it are our sophisticated Americans. The latter especially are vulnerable because of the prevalency of that dread disease best described by the phrase "because they know a thing or two they think they know it all." For Doctor Kendall is a new addition to the small group of debunkers of military frightfulness.

This book takes the wind out of the sails of the panic mongers. It makes liars of the sensationalists who harp on some secret "dew of death." Finally it presents specific instructions to guide the civilian in his conduct if he should ever experience a gas attack in time of war. The author cites facts and figures in strong array to still the fright of the most hysterical and to put common sense into a subject wherein absurdity has been as nauseating as "poison" gas itself. O. E. D.

TOUCH'D WITH MADNESS. By Hilton Howell Railey. New York: Carrick & Evans, Inc. $3.00.

THIS book is of interest here only because it contains a chapter entitled "Fortune's Fool" wherein the author narrates his very childish carryings-on in Europe in search of data for articles on the armament industries for *Fortune* magazine. L. A. C.

THROUGH THE OVERCAST—THE ART OF INSTRUMENT FLYING. By Assen Jordanoff. New York: Funk & Wagnalls Company. $3.00.

HERE is a complete and practical treatise on instrument flying by a veteran aviator. Whether the reader be a professional airman, an amateur flier, a member of the ground crew, a passenger, or just a watcher of the skies, the simplicity of treatment of an otherwise complicated subject will have an appeal. The book is illustrated by diagrams which complement the text and are especially valuable on such subjects as instrumentation, radio, and orientation. O. T. C.

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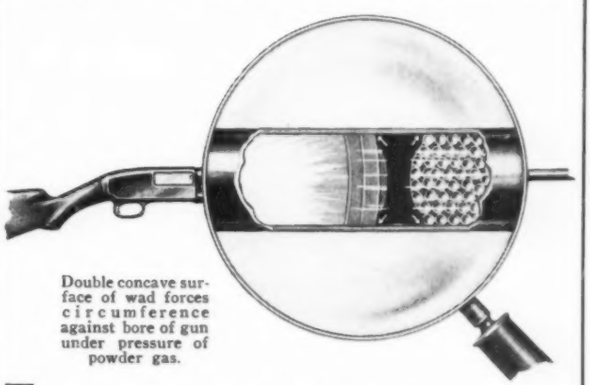

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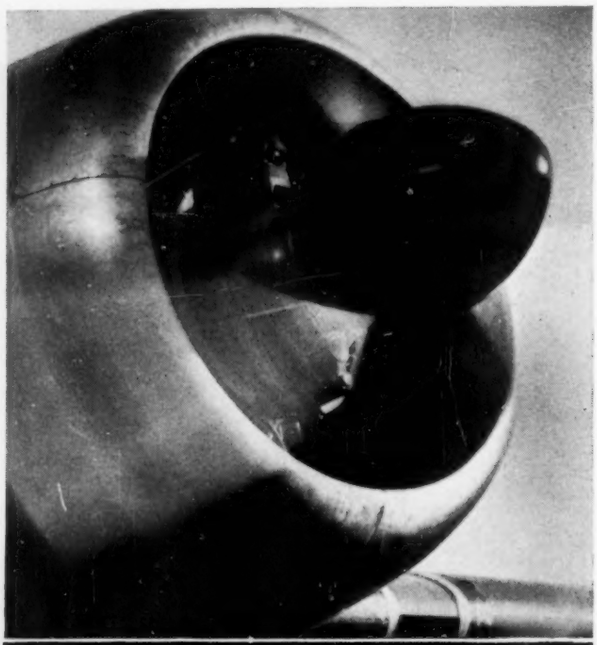

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